Betulaceae through Cactaceae of New York State

John J. Furlow
Ohio State University

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New York State Museum

Contributions to a Flora of New York State VIII
Richard S. Mitchell, Editor

Bulletin No. 476

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THE STATE EDUCATION DEPARTMENT
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THE UNIVERSITY OF THE STATE OF NEW YORK

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PREFACE

OUR GOAL in producing this series is to present a useful and authoritative account of the plants of New York State. These contributions are intended to reflect the knowledge and taxonomic opinions of specialists who prepare the manuscripts while following a generalized format for consistency. Inclusion of ecological, distributional, medical, and economic information on each species is also one of our major aims. Habitat references, flowering times, pertinent synonymy, etc., often apply specifically to New York plants rather than to the entire species. Complete illustration should facilitate identification of specimens for those who are not formally trained in botany. Descriptions are original, ordered and as complete as possible to provide sequential cross-referencing.

Distribution maps accompany species of seed plants, ferns, mosses, lichens. These are plotted by counties, to eliminate pinpointing endangered species and habitats, while offering an accurate visual picture of known collections. Maps are based on the master file at the New York State Museum, Albany, and supplemented by available data (specimens examined by the authors) from herbaria housing significant New York collections. Data or literature citations for any map may be obtained, on approval, from the New York State Museum.

We hope that these bulletins will serve individuals with interest in the flora, as well as to provide information for State and Federal agencies, conservation organizations, industry, and the scientific community. With these works go our hopes for the preservation and wise use of a precious and lifegiving resource—our State's plantlife.

The New York State Flora Committee

The steering council of the New York State Flora Committee met for the first time on January 19, 1976, and established as its goals the promotion of study of the State's plant resources and the publication of this series of museum bulletins. These contributions will be continually updated after publication for possible incorporation into larger volumes at a later date.

Members of the council at the time of this publication are:
Richard S. Mitchell, Chairman, State Botanist, N. Y. State Museum, Albany (Vascular Plants)
Charles J. Sheviak, Curator of Botany, N. Y. State Museum, Albany (Vascular Plants)
Norton G. Miller, Chief Scientist, N. Y. State Biological Survey, Albany (Bryophytes)
Clark T. Rogerson, The N. Y. Botanical Garden, Bronx (Fungi)
George J. Schumacher, Biology Dept. SUNY, Binghamton (Algae)
Gordon C. Tucker, New York State Museum (Vascular Plants)

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ACKNOWLEDGMENTS

The illustrations in this treatment are by Jane Ellen Isabella. The appendices on insects and fungi are by J. Kenneth Dean, with reviews by Timothy McCabe (insects), Clark Rogerson and John Haines (fungi), to whom we offer special thanks. Thanks also to members of the steering committee for their help. We wish to express our appreciation to the staffs and curators of the following institutions for their helpful cooperation and hospitality when we visited their collections: The New York Botanical Garden (NY), Academy of Natural Sciences of Philadelphia (PH), Cornell University (CU, BH), Syracuse University (SYRF), Harvard University (GH, NEBC), Brooklyn Botanic Garden (BKL) and The Buffalo Museum of Science (BUF). Data from the above collections were entered on computer disks for later transfer to the master file of plant distribution at the New York State Museum (NYS). The classification system employed in this flora is that of Arthur Cronquist (1981). We thank him for continuing advice through personal communication.

IMPORTANT NOTE

All economic uses, folklore, medical, and pharmaceutical notes, uses as foodstuffs, etc., are compiled from the literature and do not represent an endorsement by the authors or the New York State Museum. Some of the uses may, indeed, be dangerous if incorrectly employed. Some are not effective and are presented for historical interest only.

LEGEND

FOR ALL MAPS IN THE FOLLOWING PUBLICATION THE FOLLOWING SYMBOLS APPLY

Solid dot—specimen seen by author: data on file at the State Herbarium (NYS)

Circle—field observation with location data and observer's name on file (NYS)

Hollow triangle—-literature citation on file (NYS)

FOR ALL ILLUSTRATIONS IN THIS PUBLICATION, THE FOLLOWING LETTER-DESIGNATIONS APPLY:

A. Habit sketch
B. Fruit(s) (fruiting bract)
C. Inflorescence(s)
D. Male catkins(s)
E. Fruiting catkin(s)
F. Flower (floret)
G. Bark (trunk wedge)
H. Scale (of female catkin)
I. Involucre
J. Seed

Betulaceae (Birch Family)

The Betulaceae: a family of six genera and over 150 species of trees and shrubs. As a group, the birch family is primarily indigenous to boreal and temperate North America and Eurasia, but some species range well into the arctic, and a few extend southward into the montane tropics. The family represents an ancient assemblage; pollen and leaf fossils of both *Alnus* and *Betula* are known from the upper Cretaceous. These and the other genera of the family were widespread and highly diversified by the Middle Eocene. Members of over 30 species, representing five genera, occur in the United States and Canada; the only genus not native here is the monotypic *Ostryopsis*, closely related to *Corylus* but restricted to eastern Asia. Recent authors have abandoned the formerly popular concept of a separate family, Corylaceae. In this treatment, the family is regarded as comprising two subfamilies (Betuloideae and Coryloideae), the Betuloideae, including *Alnus* and *Betula*, and the Coryloideae, consisting of two tribes (Carpineae including *Carpinus* and *Ostrya*, and Coryleae including *Corylus* and *Ostryopsis*). The alders (*Alnus*) are notable in that their roots bear nodules containing bacteria that fix atmospheric nitrogen. Some members of the family, especially *Betula* and *Corylus* species, are grown ornamentally. The woods of birches (*Betula*) have many uses, some being especially valued in cabinet making. The peeling, white bark of the paper birch is well-known for its use as the covering of birch bark canoes. *Corylus avellana* L. of Europe is the commercial filbert, and native species of the genus are the wild hazelnuts. The hornbeam (*Carpinus*) and hop-hornbeam (*Ostrya*), also called ironwoods, are shade-tolerant, understory trees of moderate size, though of little commercial value. They are most notable for their extremely hard woods.

FAMILY DESCRIPTION

A family of deciduous shrubs and trees with simple, alternate leaves. The leaves are pinnately veined, with strong, lateral veins ending at the tips of marginal serrations. Stipules are deciduous. The plants are monoecious, bearing flowers in sexually dimorphic catkins or small clusters. Male catkins are typically more flexuous than the female ones, their florets vestigially cymulose (usually in 3's), each with as many stamens as perianth parts. Stamens are 4 (rarely 6) per floret with short-connate or distinct filaments and anther sacs that open by longitudinal slits. The perianth is of 1-4 (6) scale-like tepals (absent in the Coryloideae) with 3 or 5 inflorescence bracts subtending each cymule. Female catkins are usually shorter than the male ones, with scaly to woody bracts. The perianth (absent in the Betuloideae) consists of scale-like tepals or a reduced membranaceous fringe at the summit of the ovary. Each female floret bears a single ovary of 2 (-3) carpels and as many locules at the base, but unilocular toward the apex. The two styles usually persist on the summit of the fruit. Ovules are pendulous, 1-2 per locule, with axile placentation. The fruits are samaras, nutlets or nuts, usually borne in clusters subtended (or enclosed) by expanded bracts that may disarticulate or form persistent, papery to woody cones. Endosperm is of the nuclear type, and the seed bears a large, flat embryo (the cotyledons become enlarged and oily in *Corylus*).

KEY TO GENERA

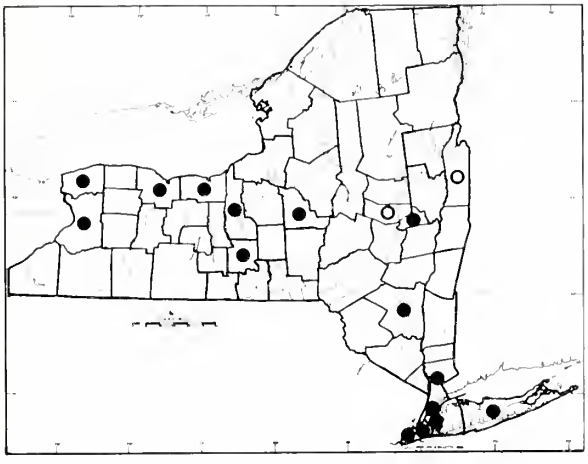
1. Fruiting catkins 10-40 mm long, cone-like, with many small, crowded, woody or coriaceous scales that are deciduous with the fruits or persistent; fruits small and laterally winged (the wings sometimes reduced to ridges) (Subfamily Betuloideae) .....(2)
1. Fruiting catkins usually more than 40 mm long, crowded or uncrowded, with large leaf-like or subfoliaceous bracts that are deciduous with the fruits; fruits unwinged, nuts or nutlets (Subfamily Coryloideae).....(3)
   2. Scales of the fruiting catkins 5-lobed, thickened, woody, persistent long after release of the fruits ..... 1. *Alnus*
   2. Scales of the fruiting catkins 3-lobed, thin or thickened (leathery) but not woody, falling with the fruits or soon afterward .....2. *Betula*
3. Fruit subtended by a single, flat, leaf-like, 3-lobed scale .....3. *Carpinus*
3. Fruit enclosed within or surrounded by 1 or more papery or leaf-like bracts .....(4)
   4. Leaves with 10 or more pairs of lateral veins; fruit a small ovoid nutlet completely contained within a closed, inflated bladder .....4. *Ostrya*
   4. Leaves with 8 or fewer pairs of lateral veins; fruit a moderately large nut, surrounded by an involucre of 2 coarsely-toothed, leafy bracts, the involucre sometimes united and long-tubular ..... 5. *Corylus*

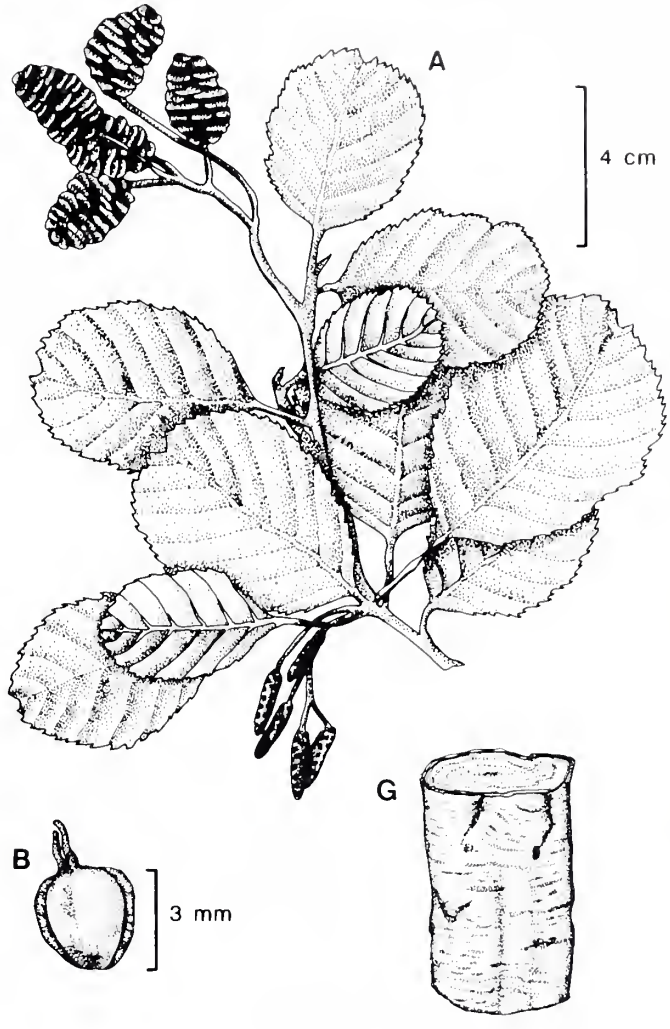
1. ALNUS

Common Name: Alder
Authority: Miller, Gard. Dict. Abr. Ed. 4., 1754
A genus of about 25 species of trees and shrubs, native primarily to the Northern Hemisphere in temperate, boreal and arctic-alpine areas, but also found in the montane tropics of Latin America. Alders are well-known pioneers, with root nodules containing the actinomycete, *Frankia*, an atmospheric nitrogen fixer. They are typically found in cool, moist habitats such as stream courses, where they often form large, continuous thickets. As is typical of northern alders, our native species are shrubby, whereas warm-temperate and subtropical alders frequently become medium-sized to large trees. Several species are cultivated as landscape plants, especially the European black alder, *Alnus glutinosa* (L.) Gaertn. The wood of *Alnus rubra* Bong., red alder, of coastal, western North America, is important in furniture manufacture and paper pulp production. Both native and introduced species of *Alnus* have been used in charcoal production.
Description: Plants monoecious; **female florets: stigma** 1 per style; **styles** 2, narrowly cylindric, persistent in fruit; **ovary** 1 per floret, cylindric, nude (presumed inferior on the basis of vestigial vascular traces); **ovules** 2, only 1 usually developing; **fruit** a tiny brown ovoid samara, dorsoventrally compressed, with a thin pericarp, crowned by the persistent styles, the wings lateral, membranaceous to thick and coriaceous, but sometimes strongly reduced; **seed** 1, closely invested within and filling the fruit; **embryo** large, straight with flat cotyledons; **endosperm** thin, nuclear; **perianth** absent; **female inflorescences:** firm, erect, cone-like catkins, in our species usually borne in clusters of 3 or 4 near the tips of the branches, formed the previous season and exposed through the winter before blooming, or produced with the new growth in the spring; **scales** subtriangular, cuneate at the base, composed of 5 partially-fused bracts, subtending 2 florets, becoming united, woody and 5-lobed in fruit; **peduncles** woody, very short and stiff to long and flexuous; **male florets: stamens** (1-) 2-4 (6); **filaments** short, undivided, opposite the tepals; **anthers** 2-chambered, longitudinally divided part way to the base; **perianth** of (2) 4 (6) tiny tepals; **male inflorescences:** pendulous cylindric catkins borne in racemose clusters of (2) 3-5 (rarely singly), in our species borne at the ends of branchlets, with numerous, helically arranged **scales**, each composed of 5 partially united bracts, bearing a cymule of 3 florets, produced the season before, blooming and exposed through the winter; **peduncles:** short, stiff; **buds** stalked or subsessile, the scales 2-3 and valvate or several and imbricate; **leaves** simple, alternate, 3-ranked to subdistichous, ovate, elliptic, obovate, or suborbicular, doubly and sometimes irregularly serrate to finely serrulate or dentate, with strong parallel secondary veins diverging from a strong midrib; **petioles** long and flexuous to stiff and short; **stipules** present, deciduous; **twigs** terete, often reddish-brown, slender to stout in trans-section with triangular pith; **bark** thin, smooth, tight, dark red brown and lustrous to dull, pale gray with pale, horizontal, pronounced to inconspicuous **lenticels**, (bark) breaking irregularly to form scales in great age, becoming brownish-gray to almost black; **trunk** of tree species straight, mostly with a pyramidal or narrowly-rounded **crown**; **root system** shallow, spreading, with nodules containing nitrogen-fixing actinomycete bacteria.

KEY TO SPECIES OF ALNUS

1. Leaves doubly serrate or coarsely and irregularly toothed; winter buds with long stalks and 2 valvate bud scales; trees or shrubs ..... (2)
1. Leaves finely toothed, serrulate or simply serrate; winter buds either with long stalks and 2 valvate bud scales or subsessile with several imbricate scales; shrubs ..... (3)
   2. Leaves obovate to more or less orbicular, the tips rounded and usually notched; moderately large trees escaped from cultivation and widely naturalized ..... 1. *A. glutinosa*
   2. Leaves mostly ovate (less frequently elliptic), the apex acute; small to large, native shrubs ..... 2. *A. incana* ssp. *rugosa*
3. Leaves broadly elliptic to obovate, the tips often more or less rounded; margins usually finely serrulate; winter buds long-stalked, covered by two equal scales ..... 3. *A. serrulata*
3. Leaves ovate to elliptic, usually with sharp tips (or occasionally almost rounded); leaf margins usually simply serrate; winter buds subsessile (the stalks not over 1 mm long), covered by 5 or more unequal scales ..... 4. *A. viridis* ssp. *crispa*





1. *Alnus glutinosa* (L.) Gaertn.

Common Names: Black Alder, Common Alder, European Alder

Type Description: Linnaeus, Species Pl. II, p. 983, 1753

Synonyms: *Alnus alnus* (L.) Britt., *A. vulgaris* Hill

Origin: Western Europe

Habitats: Riverbanks, flood plains, lake shores and other low, wet areas

Habit: Medium-sized, broadly pyramidal trees with 1 to several trunks

Flowering: March-April

Fruiting: August-September

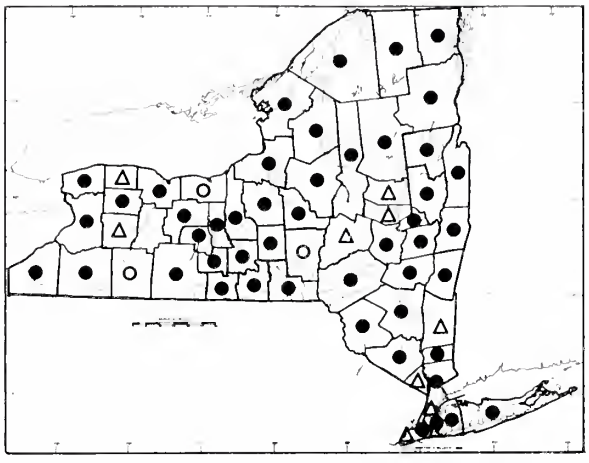
General Distribution: In North America, escaped from cultivation and widely naturalized from Massachusetts and southern New York, southern Ontario, southern Michigan and northern Illinois south to central Illinois, southern Ohio and southern New Jersey; native in Europe from central Scandinavia south to southern Spain, Italy and Asia Minor

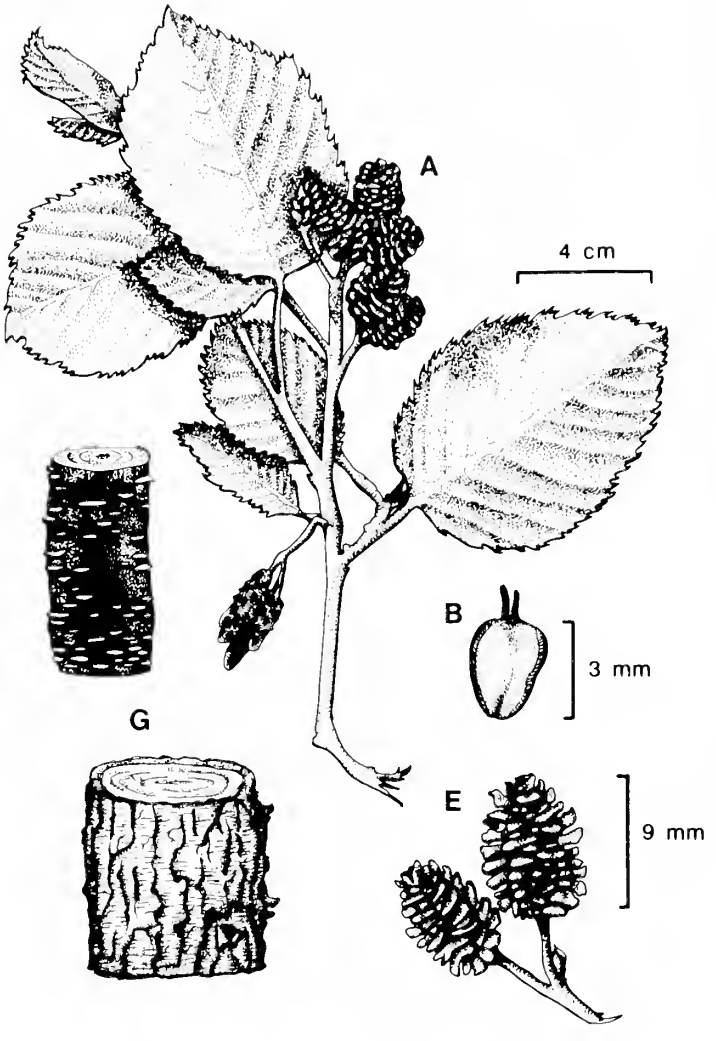
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 2 per scale in the inflorescence, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, red when receptive, 0.5-1.2 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, nude; **fruit** 2.5-3.5 mm long, 2.5-3.5 mm broad, the body obovoid, 2.0-2.7 mm broad, dark brown, the wings very reduced, thick and coriaceous, broadest near the center and much narrower than the body, not extending beyond it apically, 0.2-0.5 mm broad; only 1 **seed** developing to fill the fruit, straight, anatropous with a membranaceous testa and large, flat fleshy cotyledons partially overlapping and enclosing the short stalk; **perianth** normally absent; **female inflorescences:** firm, erect short-peduncled, conical, bracteate catkins, in one or more dense, racemose clusters of 2-4 (5), near the ends of branchlets, borne below the males, (3) 4-5 (6) mm long, 2-3 mm broad at anthesis, formed the season before blooming and exposed during winter; **scales** minute, 5-lobed; **peduncle** 1-6 mm long, 1.0-1.5 mm broad; **fruiting catkins** erect, short-peduncled, ovoid to ellipsoid, densely-arranged, cone-like, 1.2-1.6 (2.2) cm long, 1.0-1.3 cm broad, becoming dark brown at maturity, releasing fruits in fall but persisting through the winter; **scales** woody, thickened at the apex, subtriangular, shallowly 5-lobed at the apex, glabrous, 4.0-5.5 mm long, 4-6 mm broad at the apex; **peduncle** 1-10 (22) mm long, 0.5-1.5 mm broad; **male flowers: florets** subsessile, usually 3 per inflorescence scale; **stamens** 4 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, glabrous, 1.2-1.6 mm long, 0.8-1.3 mm broad, divided apically for ca. one half of their length, dehiscing longitudinally at anthesis; **filaments** 0.5-0.8 mm long, basally adnate to the tepals; **perianth** usually of 4 minute, greenish, elliptic or obovate tepals, rounded and usually bearing several medium to large brownish glands at the summit; **male inflorescences** slender, pendulous short-peduncled, cylindric, bracteate catkins, 4.0-12.5 cm long, 4.5-12.0 mm broad at anthesis, in one or more dense clusters of 2-5 at the branchlet tips, formed the sea-

son before blooming and exposed during winter, composed of 2-flowered cymules subtended by 5 partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 2-11 mm long, 0.5-1.5 mm broad; **leaves** alternate, 3-ranked to subdistichous, the blades leathery, obovate to suborbicular, coarsely and often irregularly doubly serrate, the apex rounded, retuse or obcordate, the base obtuse to broadly cuneate, (3) 4.0-7.5 (9) cm long, (2.5) 3-7 (8) cm broad, the upper surface dark green and moderately to very lustrous, sparsely glandular, the lower surface medium green and dull, glabrous to sparsely pubescent, the major veins and vein axils pilose to densely tomentose, glandular, moderately to heavily resin-coated; **petioles** terete, 0.7-2.7 cm long, glabrous to sparsely pubescent, moderately to densely glandular; **fall color** yellowish green to yellowish brown or dull pale yellow (usually differing little from the summer condition); **terminal bud** absent; **lateral buds** stipitate, more or less parallel to the twig, the body ellipsoid to obovoid, nearly terete, 6-10 mm long, 2.5-5.0 mm broad, the apex obtuse to rounded, the stalk 2-5 mm long, 1.5-2.5 mm broad, glabrous to sparsely pubescent, usually densely glandular, **bud scales** 2 or 3, the outer 2 equal, valvate, elliptical, blunt, smooth, medium red-brown, moderately to densely glandular, usually heavily resin-coated; **stipules** elliptic to obovate, 6-10 mm long, 3-5 mm broad, greenish; **branches** more or less diffuse, not conspicuously differentiated into long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, moderately to densely covered with resinous glands, green to light reddish brown, with creamy to yellowish, elliptical lenticels, moderately to heavily resin-coated; **leaf scars** somewhat raised, broad crescents with 3 nearly equidistant, crescent-shaped bundle scars; **pith** pale, continuous, triangular; **bark** of young trunks and branches thin, smooth, tight, dark brown, with moderately conspicuous, light-colored horizontally expanded **lenticels**, becoming thicker, corky with age, fissured or breaking into shallow plates; **trunks** 1 to several, up to ca. 60 cm in diameter (maximum 75 cm); **crown** pyramidal to narrowly rounded, a medium-sized tree, the branching excurrent, becoming deliquescent with age, up to 20 (35) m tall; **root system** shallow, spreading ($2n = 28$).

Variation and Hybridization: The leaves of this species are usually obovate or almost circular in shape, with a rounded or notched tip, but there are also cultivated forms having leaves with an elliptic form or an obtuse apex. A number of variants are popular in cultivation within our range, including several with deeply lobed or laciniate leaves (cvs. 'Laciniata,' 'Imperialis,' Quercifolia,' 'Lobulata,' etc.) and plants with more columnar, fastigiate, or shrubby growth forms (see Krüssmann, 1984). *Alnus glutinosa* hybridizes naturally with *A. incana* ssp. *incana* in Europe, and it has been artificially crossed with various American species, including the red alder of the western United States, *A. rubra* Bong. However, it has not been reported to hybridize with any of the eastern species.

Importance: *Alnus glutinosa* is infrequently but widely planted as an ornamental tree throughout eastern North America, where it escapes and becomes naturalized, especially along stream banks, where it may form extensive populations, as it does along the Mohawk River in central New York State. As the only tree-sized alder occurring naturally in the State, this species is easily recognized in natural settings in the early spring, before the leaves emerge, by its numerous, reddish, male catkins, which expand before those of poplars, cottonwoods and birches. In Europe, the black alder has a long history as an important hardwood timber tree, and it serves there as a source of wood for such small articles as toys, trays, tool handles, furniture and wooden shoes. It was formerly used in shipbuilding and for pilings to support structures in or near the water. Parts of Amsterdam and Venice were built on black alder piles. The bark, twigs and catkins have been used for centuries to make dyes for leather and fabrics, ranging from yellow to cinnamon and black. Today it serves as an important source of wood for paper making. In North America, as well as in Europe, large black alder populations locally assume an important position in the canopy of stream bank and floodplain forests, thus contributing to wildlife cover. The tree is used today, in both the Old World and the New, in plantings to control erosion and improve the soil on recently cleared or unstable substrates such as sand dunes. As lawn trees, black alders add interest to landscaping schemes with their irregular columnar or narrowly pyramidal shapes and dark bluish-green leaves.





2. *Alnus incana* (L.) Moench ssp. *rugosa* (DuRoi) Clausen

Common Names: Speckled Alder, Tag Alder, Swamp Alder, Hoary Alder, Alder, Aulne Blanchatre (Quebec)

Type Description: Linnaeus, Species Pl. II, p. 983, 1753

Synonyms: *Alnus rugosa* (DuRoi) Spreng., *Alnus glauca* Michx., *A. incana* var. *glauca* (Michx.) Regel, *A. incana* var. *glauca* f. *tomophylla* Fern., *A. incana* var. *tomophylla* (Fern.) Rehder, *A. incana* var. *americana* Regel, *A. rugosa* var. *americana* (Regel) Fern., *A. rugosa* var. *americana* f. *tomophylla* (Fern.) Fern., *A. rugosa* var. *americana* f. *hypomalaca* Fern., *A. rugosa* var. *typica* f. *emersoniana* Fern.

Origin: Eastern North America (the typical subspecies is Eurasian)

Habitats: Edges of streams, lake shores, bogs, swamps, low, wet fields, swales and ditches; found at elevations from near sea level along the northern Atlantic coast to 2,500 ft in the mountains

Habit: Usually a large, course spreading shrub, often forming dense thickets

Flowering: March-April

Fruiting: September-October

General Distribution: Southern Labrador to north-central Manitoba and southeastern North Dakota, northeastern Iowa, northern Indiana, central Ohio and southern Pennsylvania

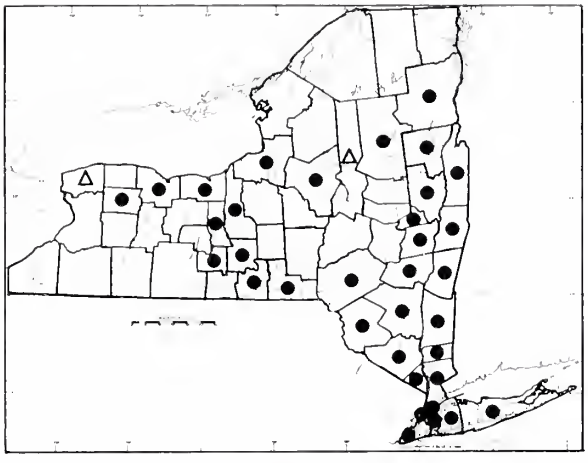
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 2 per scale in the inflorescence, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, crimson when receptive, 0.5-1.3 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, nude; **fruit** 2.5-3.5 mm long, 2.1-4.5 mm broad, the body ellipsoid to obovoid, 1.3-2.5 mm broad, brown, the wings relatively thick and coriaceous, much narrower than the body, not extending beyond the body apically, 0.4-1.0 mm broad; 1 straight **seed** developing to fill the fruit, anatropous, with a membranaceous testa and large flat fleshy cotyledons partially overlapping and enclosing the short stalk; **perianth** normally absent; **female inflorescences:** firm, erect subsessile conical bracteate catkins, densely arranged in 1 or more racemose clusters of (2) 3-6 near the ends of branchlets below the male, 2-5 mm long, 1.2-2.5 mm broad at anthesis, formed the season before blooming and exposed during winter; **scales** minute, 5-lobed; **peduncle** 0.2-2.1 mm long, 0.8-1.0 mm broad; **fruiting catkins** ellipsoid to subglobose, densely-arranged, cone-like, 6-10 (17) mm long, 6-8 (11) mm broad, becoming dark brown at maturity, releasing their fruits in fall, but persisting through the winter; **scales** woody, apically thickened, subtriangular, shallowly 5-lobed at the apex, glabrous, 3.5-4.5 mm long, 3-4 mm broad at the apex; **peduncle** (0.2) 1-6 (8) mm long, 1.0-1.5 (2) mm broad; **male flowers: florets** reduced, subsessile, usually 3 per scale of the inflorescence; **stamens** usually 4 per floret, opposite the tepals; **anthers** cylindrical, 2-chambered, 0.9-1.2 mm long, 0.8-1.2 mm

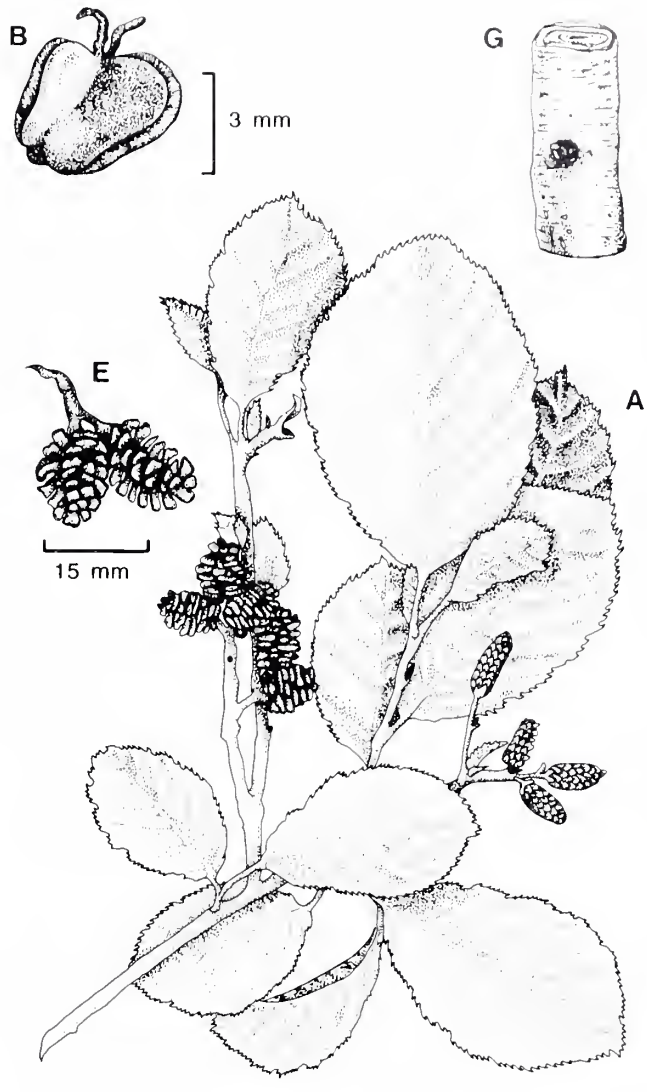
broad, divided apically for one third to one half their length, dehiscing longitudinally at anthesis; **filaments** 0.4-1.0 mm long, basally adnate to the tepals; **perianth** of 4 minute, greenish tepals, that are elliptic or obovate, rounded and usually bear several medium to large, brownish glands at the apex; **male inflorescences** slender, pendulous, short-peduncled, cylindric, bracteate catkins, 2-7 cm long, 5-8 mm broad at anthesis, borne in 1 or more clusters of 2-4 at the tips of branchlets, formed the season before blooming and exposed during winter, composed of 2-flowered cymules subtended by 5 partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 1-9 (11) mm long, 0.8-2.0 (2.2) mm broad; **leaves** alternate, 3-ranked to subdistichous, the blades somewhat leathery, broadly ovate to elliptic, coarsely and often irregularly doubly serrate, the apex acute (to obtuse), the base rounded or cuneate, (2.5) 4-9 (11) cm long, (1.3) 3.0-7.5 cm broad, the upper surfaces glabrous to sparsely pubescent, sparsely to moderately glandular, lower surfaces glabrous to velutinous, moderately pubescent to tomentose along the major veins and in vein axils, sometimes covered with scattered resinous glands, these usually inconspicuous, often slightly to heavily glaucous; **petioles** terete, (0.4) 0.8-1.7 (2) cm long, glabrous to sparsely pubescent, sparsely to moderately glandular; **fall color** bluish to brownish green (differing little from the summer condition); **terminal bud** absent; **lateral buds** stipitate, oriented parallel to the twig, the body ellipsoid, nearly terete, 3-7 mm long, 1.5-3.0 mm broad, the apex acute to slightly rounded, the stalk 2-4 mm long, 1-2 mm broad, sparsely pubescent to velutinous, **bud scales** 2 or 3, the outer 2 valvate, elliptic, blunt, smooth, medium brown; **stipules** broadly elliptical to obovate, 6-10 mm long, 2.0-3.5 mm broad, ciliate, greenish; **branches** more or less diffuse, not usually differentiated into obvious long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, often with scattered, resinous glands, denser at the nodes, young bark reddish brown, covered scattered, pale, elliptic lenticels; **leaf scars** raised, triangular to crescent-shaped, with 3 nearly equidistant, deeply crescent-shaped bundle scars; **pith** pale, continuous, distinctly triangular; **bark** thin, smooth, tight, dark reddish brown, covered with conspicuous pale, moderately-expanded, horizontal **lenticels**, becoming thicker, corky and furrowed in age; **trunks** usually several, to 17 cm in diameter (maximum 25 cm); **crown** rounded, irregular, a large, spreading shrub, the branching usually deliquescent, up to 10 (17) m tall; **root system** shallow, spreading (2n = 28).

Variation and Hybridization: A variable species with slightly different leaf forms in different parts of its range, grading into ssp. *tenuifolia* (Nutt.) Breitung to the west, which is a more tree-like race in which the leaves have more distinct or lobe-like major teeth. The leaves of our speckled alders are frequently densely glaucous below (var. *americana* Fern.) and vary from nearly glabrous to densely pilose (f. *emersoniana* Fern., var. *americana* f. *hypomalaca* Fern.). Individual variants often seem distinctive, but show little distributional continuity and occur in all degrees of intergradation. An irregularly cut-leafed form (var. *americana* f. *tomophylla* Fern.) has been described (from Newfoundland), but it has been little noted since the original collection. Other than in growth habit, *A. incana* ssp. *rugosa* is not strongly differentiated from the more tree-like ssp. *incana* of Europe, which is sometimes cultivated in our area and could be expected to escape. *Alnus incana* ssp. *rugosa* hybridizes readily with *A. serrulata* where their ranges intersect or overlap, including the southeastern region and the Hudson Valley in our area. Plants of hybrid origin usually have elliptic to subobovate leaves with an intermediate, irregularly toothed margin. The leaves of genetically pure *A. incana* ssp. *rugosa* nearly always have a more or less regular, distinctly doubly serrate margin, while those of *A. serrulata* are nearly always evenly serrulate.

Importance: The speckled alder is an important element in wetland succession. Its thickets along streambanks and lake shores provide wildlife habitat and erosion control, and its roots bear nodules containing actinomycete endophytes which are able to fix atmospheric nitrogen. In ditches, pastures and other wet places, it can also become a troublesome weed that is difficult to control or eliminate. Where it occurs in great numbers, its wind-carried pollen causes hay fever allergies. At the time of colonization, European settlers as well as Native Americans in eastern North America utilized the astringent properties of bark extracts from *Alnus incana* for a variety of medical remedies, including poultices for wounds and infusions and teas to treat external sores, diarrhea, hematuria, stomatitis, leucorrhea and other ailments, including venereal diseases and "intermittent fever." The tannin-rich bark has also long been a source of dyes and for tanning leather, and the branches provide firewood and charcoal.

Note: Speckled alder is a familiar colonizer of swales, ditches, and other wet places. It is common in the northern part of the State, but becomes less frequent to the south, and is absent from the Coastal Plain, where it is replaced by the following species.





3. *Alnus serrulata* (Ait.) Willd.

Common Names: Smooth Alder, Hazel Alder, Red Alder, Alder

Type Description: Aiton, Hort. Kew. 3: 338, 1789

Synonyms: *Alnus rugosa* var. *serrulata* (Ait.) Winkler, *A. rubra* Tuckerman, not Bong., *A. noveboracensis* Britt., *A. serrulata* var. *subelliptica* Fern., *A. serrulata* var. *subelliptica* Fern., *A. serrulata* var. *subelliptica* f. *emarginata* Fern., *A. serrulata* var. *subelliptica* f. *mollescens* Fern., *A. serrulata* var. *subelliptica* f. *nanella* Fern., *Alnus rugosa* of Amer. authors, not Spreng.

Origin: Eastern North America

Habitats: Streambanks, edges of sloughs, swampy fields, ditches and margins of bogs and lake shores, from near sea level to elevations of about 2,100 ft in the Southern Appalachian and Ozark Highlands.

Habit: A medium-sized to large, compact shrub

Flowering: February-April

Fruiting: September-October

General Distribution: Mostly coastal in distribution, but also present in the Southern Appalachians and Ozarks; southern Nova Scotia and southeastern Quebec southwest to central Missouri and eastern Oklahoma, south to the Gulf of Mexico and northern Florida; disjunct along the St. Lawrence River and the southern Great Lakes to northern Ohio and northern Indiana

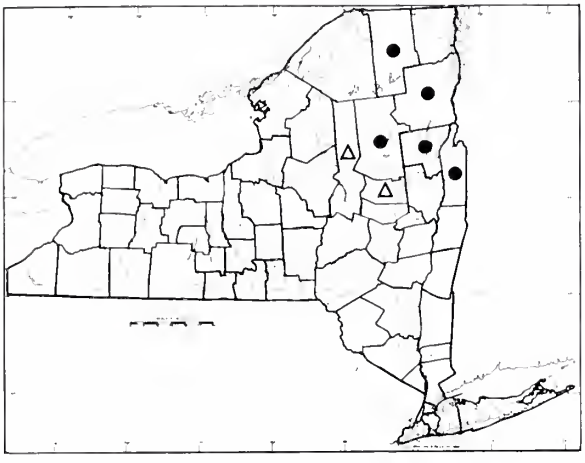
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 2 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.7-1.4 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, nude; **fruit** 2.2-3.3 mm long, 1.7-3.4 mm broad, the body obovoid, 1.2-2 mm broad, light brown, the wings very narrow, thick and coriaceous, broadest near the center, not extending beyond the fruit body apically, 0.2-0.5 mm broad; a single, straight **seed** developing to fill the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons partially overlapping and enclosing the short stalk; **perianth** normally absent; **female inflorescences** firm erect short-peduncled conical bracteate catkins in 1 or more dense, racemose clusters of (2) 3-5 near the branchlet tips, borne below the males, 3-6 mm long, 1.2-2.5 mm broad at anthesis, formed the season before blooming and exposed during winter; **scales** minute, 5-lobed; **peduncle** 0.2-2.1 mm long, 0.8-1.0 mm broad; **fruiting catkins** erect, short-peduncled, ovoid to ellipsoid, densely-arranged, cone-like, 10-17 (22) mm long, (6) 8-10 mm broad, becoming dark brown at maturity, releasing their fruits in fall but persisting through the winter; **scales** woody, apically thickened, subtriangular, shallowly 5-lobed at the apex, glabrous, 3.0-4.5 mm long, 3-4 mm broad at the apex; **peduncle** 0.2-5.0 (8) mm long, 0.8-1.2 (2) mm broad; **male flowers: florets** subsessile, usually 3 per inflorescence scale; **stamens** 4 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, 0.8-1.1.0 mm long, 0.8-1.0 mm broad, divided apically for about one third their length, dehiscing longitudinally at anthesis; **filaments** 0.6-0.9 mm long, basally adnate to

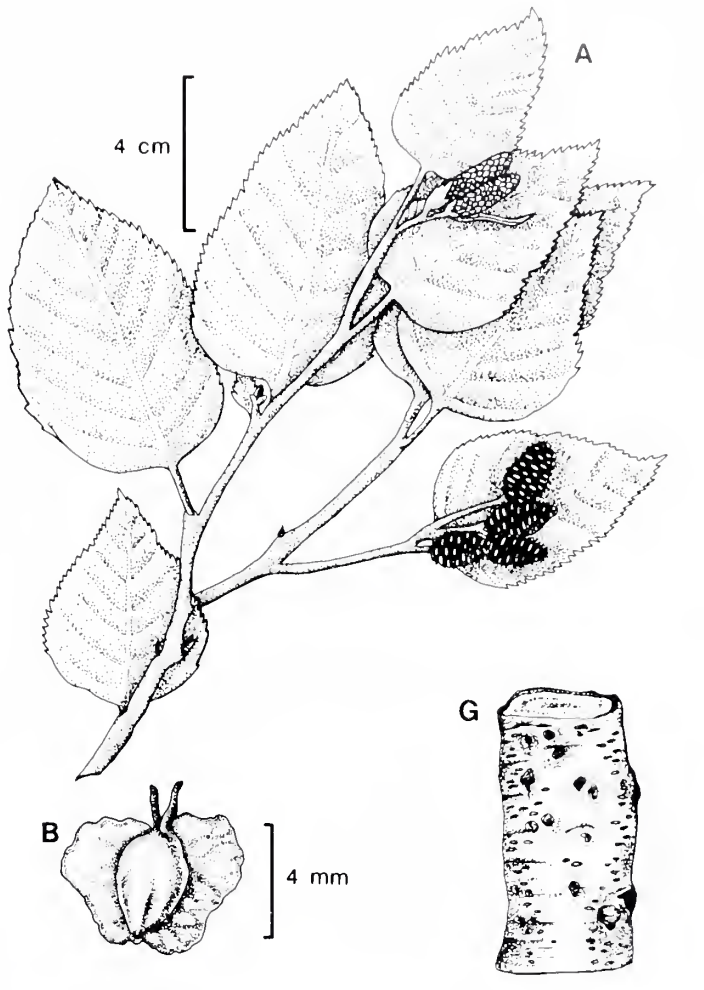
the tepals; **perianth** usually of 4 minute, elliptic to obovate, greenish tepals, rounded and usually bearing several medium-sized glands at their summits; **male inflorescences** slender, pendulous, short-peduncled, cylindric bracteate catkins, 3.0-8.5 cm long, 4-10 mm broad at anthesis, in 1 or more dense clusters of 3-5 at the tips of branchlets, formed the season before blooming and exposed during the winter, composed of 2-flowered cymules subtended by 5 partially fused bracts; **scales** (the primary bracts) broadly ovate, acute; **peduncle** glabrous, 1-5 (8) mm long, 0.5-1.2 mm broad; **leaves** alternate, 3-ranked to subdistichous, the blades leathery, elliptic to obovate or (rarely) ovate, (4) 5-9 (15) cm long, (2) 3.5-6.5 (7.5) cm broad, serrulate to finely and obscurely doubly serrate, the apex obtuse or rounded, the base broadly cuneate, upper surface medium to dark green, dull to moderately lustrous, glabrous to sparsely pubescent, moderately to heavily glandular, the lower light to medium green, glabrous to sparsely pubescent, usually tomentose along the major veins and in vein axils, moderately to densely glandular, often lightly to heavily glaucous; **petioles** terete, (0.2) 0.6-1.5 (2.2) cm long, glabrous to moderately villous or tomentose, sparsely to moderately glandular; **fall color** yellow-green to brownish green (differing little from the summer condition); **terminal bud** absent; **lateral buds** stipitate, more or less parallel to the twig, the body ellipsoid to obovoid, nearly terete, 3-6 mm long, 2-3 mm broad, the apex acute to slightly rounded, the stalk 1.5-3.0 mm long, 1.0-1.5 mm broad, sparsely to moderately pubescent, covered with resinous glands, **bud scales** 2 or 3, the outer 2 equal, valvate, elliptical, blunt, smooth, medium brown; **stipules** elliptic to obovate, 2.5-5.5 cm long, 1.6-3.0 mm broad, greenish; **branches** more or less diffuse, not conspicuously differentiated into long and short shoots; young **twigs** terete, mostly glabrous, sometimes with scattered resinous glands, especially at the nodes, light brown to dark red-brown, often glaucous, with inconspicuous, yellowish, elliptic lenticels; **leaf scars** somewhat raised, triangular to crescent-shaped with 3 nearly equidistant, crescent-shaped bundle scars; **pith** pale, continuous, triangular; **bark** thin, smooth, tight, light gray, **lenticels** small and inconspicuous, becoming somewhat thicker, corky and scaly with age; **trunks** usually several, ascending, to about 16 cm in diameter (maximum ca. 16 cm); **crown** rounded, a large compact to spreading shrub, the branching usually deliquescent, up to 10 (14) m tall; **root system** shallow, spreading (2n = 28).

Variation and Hybridization: Like *Alnus incana* ssp. *rugosa*, *A. serrulata* is variable in foliage characteristics, particularly leaf shape and pubescence. Fernald recognized plants with broadly elliptic, acute-tipped leaves as var. *subelliptica*; however, the specimens upon which this variety was based were all collected (in Massachusetts) in the region of geographical overlap of *A. serrulata* and *A. incana* ssp. *rugosa*, and they thus probably represent part of a hybrid swarm. Typical *A. serrulata* is distinguished by obovate or obovate-elliptic leaves, broadest above the middle, with a finely and evenly serrulate margin. Hybrids of *A. serrulata* with *A. incana* ssp. *rugosa* are common in eastern New York, where the ranges of these species overlap, but such plants are usually recognizable on the basis of their intermediate leaf characters (as described above under *A. incana* ssp. *rugosa*). Plants having densely pubescent leaves were given form names by Fernald (*e.g.*, f. *noveboracensis* (Britt.) Fern., var. *subelliptica* f. *mollescens* Fern.), but none of these groups have distinctive geographical ranges, nor do Fernald's leaf-shape forms (f. *nanella* Fern. and var. *subelliptica* f. *emarginata* Fern.).

Importance: Smooth alder, like speckled alder, forms thickets in wet open habitats, creating the same kinds of benefits and problems. Like the speckled alder, its bark has long been used to make astringent medicines to treat wounds, inflammations and various internal disorders, and the extract has been used to tan leather and dye fabrics. Both species are used for firewood and charcoal, but, due to their small stature, neither has attained significant commercial value.

Note: *Alnus serrulata* occurs chiefly outside of the Adirondack region, and primarily in the southern part of the State. It is basically coastal in distribution, ranging throughout the southeastern United States, reaching as far north on the Atlantic Coastal Plain as Long Island, then up the estuarine Hudson Valley. It also occurs in the Mississippi Embayment, extending north to southern Illinois and Indiana. Like many coastal species, it follows the St. Lawrence River system and the Lower Great Lakes westward, accounting for scattered populations in northern Pennsylvania, Ohio and Indiana, and it is a familiar element along streams in both the Southern Appalachians and the Interior (Ozark) Highlands.





4. *Alnus viridis* (Vill.) Lam. & DC. ssp. *crispa* (Ait.) Turrill

Common Names: Green Alder, Mountain Alder, Aulne Vert (Quebec)

Type Description: Villars, Hist. Pl. Dauph. 3(1): 789, 1789

Synonyms: *Alnus crispa* (Ait.) Pursh, *A. alnobetula* var. *crispa* (Ait.) Winkler, *A. viridis* var. *crispa* (Ait.) House, *A. mollis* Fern., *A. crispa* var. *mollis* (Fern.) Fern., *A. crispa* var. *fernaldi* House, *A. crispa* var. *elongata* Raup, *A. crispa* f. *stragula* Fern., *A. crispa* var. *harricanensis* Lepage, *Betula viridis* Vill.

Origin: Northern North America (the typical subspecies is Eurasian)

Habitats: Along streams, lake shores, coasts and the margins of bogs and muskegs, or on sandy or gravelly slopes or flats from near sea level in the North to about 6,000 ft in New Hampshire and North Carolina; growing singly or forming dense thickets

Habit: A small, compact to large, open, spreading shrub

Flowering: May-June

Fruiting: September-October

General Distribution: Northern Labrador and southwestern coastal Greenland west to Alaska, south to south-central Alberta and Manitoba, northern Minnesota, Wisconsin, Michigan, southern Ontario, central New York, and northern Massachusetts; disjunct populations also occur in south-central Pennsylvania and west-central North Carolina on the Tennessee border.

Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 2 per scale in the inflorescence, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, dark crimson when receptive, 0.4-1.0 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, nude; **fruit** (2.5) 3-4 mm long, 3-6 mm broad, the body ellipsoid to obovoid, 1.5-2.2 mm broad, light brown, the wings as broad as or slightly narrower than the body, broadest near the summit, extending beyond the body apically, (0.7) 1.5-2.0 mm broad; only 1, straight **seed** developing, filling the fruit, anatropous with a membranaceous testa and large, flat, fleshy cotyledons partially overlapping and enclosing the short stalk; **perianth** normally absent; **female inflorescences:** firm, pendulous, long-peduncled, conical, bracteate catkins, densely arranged in a racemose cluster of 3-7 near the ends of the new growth in the spring, borne below the males, 5-8 mm long, 1.5-2.5 mm broad at anthesis; **scales** minute, 5-lobed; **peduncle** 2-7 mm long, 0.4-0.8 mm broad; **fruiting catkins** pendulous, long-peduncled, ellipsoid to subcylindric, densely-arranged, cone-like, 1.0-1.5 (2) cm long, 0.5-1.2 cm broad, becoming light brown at maturity, releasing the fruits in the fall but persisting on the branches through the winter; **scales** woody, apically-thickened, subtriangular, shallowly 5-lobed at the apex, glabrous, 4-6 mm long, 2.7-4.5 (6) mm broad at the apex; **peduncle** 0.5-4.5 (5.5) cm long, 1.0-1.5 mm broad; **male flowers: florets** subsessile, usually 3 per scale in the inflorescence; **stamens** usually 4 per floret, opposite the tepals; **anthers** cylindric, 2-cham-

bered, 1.0-1.5 mm long, 0.7-1.3 mm broad, divided apically for one half to three fourths of their length, dehiscing longitudinally at anthesis; **filaments** 0.7-1.0 mm long, basally adnate to the tepals; **perianth** usually of 4 minute, greenish tepals, these elliptic or obovate, rounded and usually bearing several medium to large, brownish glands at the apex; **male inflorescences** slender, pendulous, subsessile, cylindric, bracteate catkins, borne in dense clusters of 2-3 (4) at the ends of branchlets, formed the season before blooming and exposed during winter, 2.5-9.0 (12) cm long, 5-10 mm broad at anthesis, composed of 2-flowered cymules subtended by partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 0.2-1.0 mm long, 0.5-1.0 mm broad; **leaves** alternate, 3-ranked to subdistichous, the blades somewhat coriaceous, broadly to narrowly ovate or elliptical, (2) 3.5-8.5 (15.5) cm long, 3-6 (12.8) cm broad, finely doubly serrate or serrulate, the apex (acute to) obtuse, the base usually rounded or cuneate, the upper surface medium to dark green and dull (lustrous when young), glabrous to sparsely pubescent, sparsely to moderately glandular, the lower surface light to medium green and dull to moderately lustrous, essentially glabrous to velutinous, more densely pubescent along the major veins and in vein axils, sometimes covered with moderately large, whitish or yellowish glands, usually heavily resin-coated; **petioles** terete, (0.3) 0.5-1.5 (2.4) cm long, glabrous to moderately villous or velutinous, sparsely to densely glandular; **fall color** bluish to brownish green (differing little from the summer condition); **terminal bud** absent; **lateral buds** subsessile, ellipsoid, nearly terete, 5-10 mm long, 2-4 mm broad, the apex acute to abruptly acuminate, the stalk 0.5-1.0 mm long, 1.0-2.5 mm broad, sparsely pubescent to velutinous, **bud scales** 2 or 3, the outer 2 valvate, elliptic, blunt, smooth, medium brown; **stipules** ovate, ovate-oblong or elliptic, 7-9 mm long, 2-5 mm broad, ciliate, greenish; **branches** more or less diffuse, conspicuously differentiated into long and short shoots; young **twigs** terete, often with prominent longitudinal ridges originating at the nodes, glabrous, slightly to heavily glandular at the nodes, reddish brown, with scattered, pale, elliptical lenticels; **leaf scars** raised, crescent-like, with 3 nearly equidistant, inconspicuous, crescent-shaped, whitish vascular bundle scars; **pith** pale, continuous, triangular in transection; **bark** thin, smooth, tight, light gray, **lenticels** small and inconspicuous, becoming somewhat thicker, corky and scaly with age; **trunks** several, ascending to decumbent in harsh habitats, to ca. 10 cm in diameter (maximum ca. 20 cm) **crown** rounded, irregular, a small to large spreading shrub, the branches deliquescent, up to 6 (9) m tall; **root system** shallow, spreading (2n = 28).

Variation and Hybridization: *Alnus viridis* is vegetatively variable, often on a geographical basis. In our area, it usually consists of bushy, upright shrubs with rather small, glutinous, ovate leaves with more or less evenly fine-serrate margins. To the northeast (from Labrador to central Quebec, south to Newfoundland and northern New England) occur populations with densely pilose to tomentose leaves (var. *mollis* Fern.), and to the west, in southern Manitoba and Saskatchewan, there is a form with narrowly elliptic leaves (var. *harricanensis* Raup & Abbe). In our plants, leaf pubescence varies from sparse to rather heavy, as does the occurrence of large, resinous glands on the lower leaf surfaces. Leaf blade shape varies from purely ovate to broadly elliptic, the leaf apices from acute to rounded, and the margins from finely serrulate to more or less distinctly (though always finely) doubly serrate (especially on vigorous shoots). However, in spite of this variability, its members are easily recognized by their essentially sessile buds with many scales, and by their long-peduncled fruiting catkins. Unlike our other alders, only the male inflorescences are produced the season before blooming and exposed during the winter. This species is not known to hybridize with other alders in the Northeast.

Importance: *Alnus viridis* ssp. *crispa* forms low, dense thickets on hillsides and mountain slopes, contributing to soil stability and providing cover for wildlife. It is a successional species that may improve the soil as the result of nitrogen-fixing action of its root-nodule endophytes. Like the other alders, the green alder produces abundant pollen in spring, and its pollen is an important hay fever causing agent (aeroallergen) when abundant. The species has had limited medicinal use as an astringent and in ways similar to other alders, but its use by man has mostly been as a source of firewood and charcoal.

Note: *Alnus viridis* is a circumpolar species with four geographical subspecies in mountainous Europe, northern Asia and coastal northwestern North America, mountainous western North America and eastern North America and Greenland. Subspecies *crispa* extends southward in the Appalachian Highlands at progressively higher elevations, reaching its southernmost station on the summit of Roan Mountain on the Tennessee-North Carolina border. In New York it occurs only at higher elevations in the Adirondack region.

2. BETULA

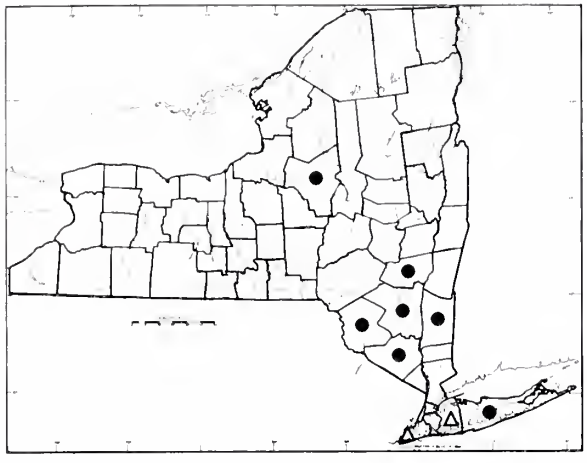
Common Names: Birch
Authority: Linnaeus, Species Pl. II, p. 422, 1753
A genus of about 35 species of trees and shrubs, native mostly to cool-temperate, boreal and arctic-alpine regions in the Northern Hemisphere. Although birches are characteristically boreal and subarctic, some species occur in cool or moist places as far south as Georgia in the Appalachian Mountains, and, in the Rocky Mountains, as far south as New Mexico. One species (*Betula nigra* L.) ranges widely throughout the southeastern United States. Three natural subgroups of the genus occur in New York. Section *Costatae* consists of large, mostly dark-barked trees, including our yellow birch (*B. alleghaniensis* Britt.), sweet birch (*B. lenta* L.), and river birch (*B. nigra* L.). The familiar white-barked species, including the paper birch (*B. papyrifera* Marsh.) and the gray birch (*B. populifolia* Marsh.), form the second subgroup (section *Betula*), while the shrubby dwarf birches of the far North, including *B. pumila* L. and *B. glandulosa* Michx., comprise section *Humiles*. Several birch species are important hardwood timber producers, and others are cultivated widely as landscape trees.

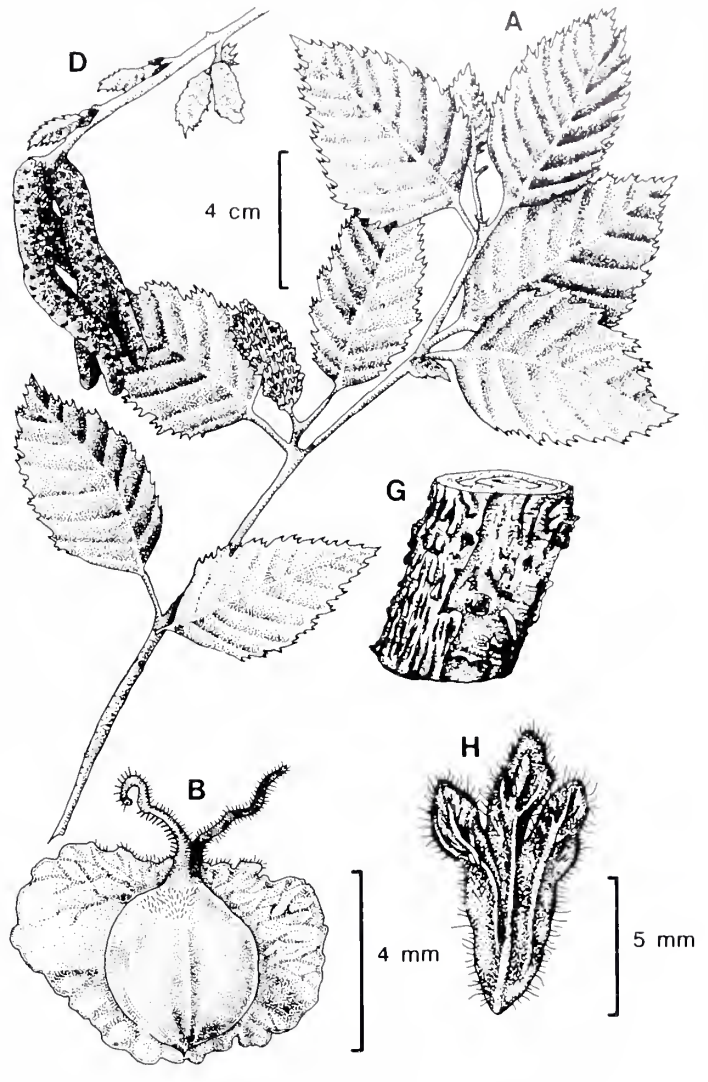
Description: Plants **monoecious**; **female florets: stigma** 1 per style; **styles** 2, narrowly cylindric, persistent in fruit; **ovary** 1 per floret, cylindric, nude (apparently inferior on the basis of vestigial, vascular traces); **ovules** 2, one usually developing; **fruit** a tiny, brown, ovoid samara, dorsiventrally compressed, with a thin pericarp, crowned by the persistent styles, the wings lateral, membranaceous; **seed** 1, closely invested within the fruit; **embryo** large, straight, with flat cotyledons; **endosperm** thin, nuclear; **perianth** absent; **female inflorescences:** firm, erect, cone-like catkins, in our species borne singly on short lateral shoots, produced with new growth in the spring; **scales** subtriangular or cruciform, acuminate, cuneate at the base, consisting of 3 partially united bracts subtending 3 florets and usually becoming coriaceous or woody and 3-lobed in fruit; **peduncle** woody, very short to moderately long and stiff; **male florets: stamens** (1) 2-4; **filaments** short, divided nearly to the base, opposite the tepals; **anthers** 2-chambered, divided longitudinally into two separate 1-chambered parts; **perianth** of 2-4 tiny tepals; **male inflorescences:** pendulous, cylindric catkins borne singly or in racemose clusters of 2-4 (5) at branchlet tips or on short lateral shoots on the main branchlets, formed the season before blooming and exposed through the winter, with numerous helically-arranged **scales** composed of 3 partially united bracts, each bearing a cymule of 3 florets; **peduncles:** usually short, stiff; **buds** sessile, their scales several and imbricate; **leaves** simple, alternate, more or less 2-ranked, ovate, elliptic, obovate, or suborbicular, doubly and sometimes irregularly serrate to finely serrulate, or sometimes simply and coarsely dentate, with strong parallel, secondary veins diverging from a strong midrib; **petioles** long and flexuous to rather stiff and short; **stipules** present, deciduous; **twigs** terete, often reddish-brown, slender to stout, with circular to remotely triangular pith; **bark** thin, smooth, tight (non-peeling) to freely exfoliating in thin sheets, dark red brown, light or dark yellow-brown or gray, bronze or pinkish to chalky white, lustrous to dull, often with strongly contrasting light or dark, horizontal **lenticels**, these and branch scars frequently greatly elongated in maturity, becoming extensively corky and breaking irregularly into scales with age, brownish-gray to black; **trunks** of tree species usually straight, with a narrowly- to broadly-rounded **crowns**; **root systems** shallow, spreading.

KEY TO SPECIES OF BETULA

1. Larger leaves generally more than 4 cm long, with (4) 5-12 pairs of lateral veins; medium-sized to large trees of moderate habitats.....(2)
1. Larger leaves mostly less than 4 cm long, with 2-4 (5) pairs of lateral veins; shrubs or small, bushy trees of bogs or peaks.....(9)
   2. Fruits with wings narrower than the fruit body; bark of mature trunks and branches mostly dark to medium reddish or yellowish brown, sometimes partly (but not completely) grayish white, with or without greatly expanded horizontal lenticels; fruiting catkins conical or subglobose, erect, the scales often remaining attached into early winter.....(3)
   2. Fruits with membranaceous wings as wide as or wider than the fruit body; bark of mature trunks and branches chalky to creamy white or bronze-tinged, with greatly expanded, dark, horizontal lenticels; fruiting catkins elongate, more or less cylindric, pendulous, readily shattering when mature.....(5)
3. Leaves subrhombic, the base broadly wedge-shaped, the apex acute, both with more or less straight sides; scales of the fruiting catkins divided above the middle, with 3 narrow ascending lobes, about equal in length and breadth; twigs lacking a wintergreen odor.....1. *B. nigra*
3. Leaves ovate to elliptic or oblong, the base rounded to subcordate, the apex acute to acuminate; scales of the fruiting catkin branching at or below the middle, the lobes not similar in size and shape; twigs with a distinctive wintergreen odor.....(4)
   4. Leaves with coarse, rather irregular teeth; bark of limbs and trunks exfoliating; scales of fruiting catkins pubescent.....2. *B. alleghaniensis*
   4. Leaves with very fine, sharp teeth; bark tight, not freely exfoliating; scales of fruiting catkins glabrous.....3. *B. lenta*

5. Leaves ovate or rhombic-ovate to elliptic or oblong, usually pubescent below, the apex acute or short-acuminate; the central lobe of the fruiting catkin scales equal to or longer than the lateral lobes; bark exfoliating on mature trunks .....(6)
5. Leaves rhombic to more or less deltoid, glabrous below, the apex acuminate to long-acuminate; the central lobe of the scales of the fruiting catkins shorter than the lateral lobes; bark of mature trunks either tight or exfoliating.....(8)
   6. Larger leaves mostly cordate at the base, with 9-12 pairs of lateral veins; the lateral lobes of the fruiting catkin scales turned toward the apex; mature bark usually rather dark, tinged pinkish brown or bronze, less often white.....4. *B. cordifolia*
   6. Larger leaves cuneate, rounded, or truncate at the base, with 9 or fewer pairs of lateral veins; the lateral lobes of the fruiting catkin scales held at nearly right angles to the axis; mature bark white or brownish.....(7)
7. Leaves of fruiting branches 5-12 cm long; mature fruiting catkins 6-10 cm long; mature bark creamy white.....5. *B. papyrifera*
7. Leaves of fruiting branches (3) 4-5 cm long; mature fruiting catkins 3-4 (6) cm long; mature bark pale brown.....6. *B. pubescens*
   8. Leaves pubescent below, their bases truncate; bark tight, grayish white.....7. *B. populifolia*
   8. Leaves glabrous below, their bases cuneate; bark exfoliating, creamy white .....8. *B. pendula*
9. Leaves ovate, doubly serrate, the apex acuminate.....9. *B. minor*
9. Leaves ovate to suborbicular, simply toothed, the apex acute to rounded; male catkins produced with the new growth in the spring .....(10)
   10. Leaves 2-3 (4) cm long, narrowly obovate to elliptic, the apex acute to obtuse or rounded, the base cuneate to rounded, glabrous to tomentose below; twigs glabrous to inconspicuously small-glandular, but without large resinous glands; erect to spreading shrubs of bogs and calcarious fens.....10. *B. pumila*
   10. Leaves 1-2 cm long, broadly obovate, the apex rounded, the base cuneate, mostly glabrous below; twigs essentially glabrous to warty with large resinous glands; in New York, low depressed shrubs of harsh alpine summits.....11. *B. glandulosa*





1. *Betula nigra* L.

Common Names: River Birch, Red Birch

Type Description: Linnaeus, Species Pl. II, p. 983, 1753

Synonyms: *Betula lanulosa* Michx.

Origin: Eastern North America

Habitats: Bottomlands and borders of streams at low elevations, often where the land is periodically inundated; infrequent in New York State, in southeastern counties in the lower Hudson Valley

Habit: A large tree, usually with several short, crooked or leaning trunks and a broad, round crown

Flowering: April-May

Fruiting: May-June.

Note: These trees are unique among our birches in shedding their fruits in early summer rather than the fall. The fruits may germinate immediately on contact with the ground, without overwintering like the other birches.

General Distribution: Southeastern New Hampshire and southwestern Connecticut, southern Michigan, Minnesota south to eastern Kansas, eastern Texas and northern Florida

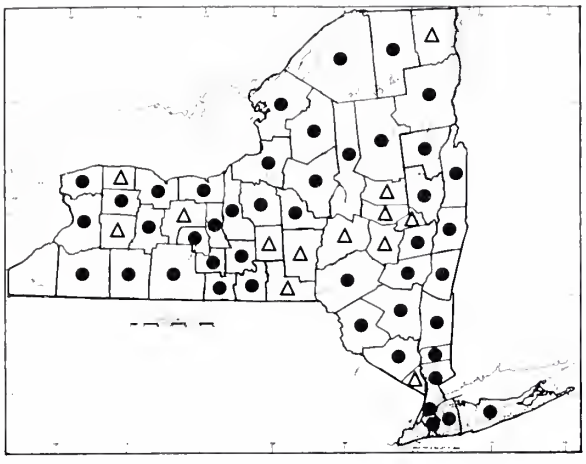
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.8-1.8 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.8 mm long, nude; **fruit** 3.4-5.0 mm long, 6.5-10 mm broad, the body ovoid to ellipsoid, 2.6-3.8 mm broad, brown, the wings narrower than the body, broadest near the summit, not extending beyond the body apically, 1.8-3.2 mm broad; 1 straight **seed** developing and filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect, subsessile, cylindric, densely bracteate catkins, borne singly on short shoots below the males, 4-5 mm long, 2-3 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle** ca. 1 mm long, 1.5 mm broad; **fruiting catkins** erect, short-peduncled, cylindric, dense and cone-like, 1.5-3.0 cm long, 1.0-2.5 cm broad, turning brown and shattering with the fruits in late spring or early summer; **scales** coriaceous to somewhat woody, 3-lobed, pubescent, 6-13 mm long, 3-5 mm broad at the apex, the lobes narrow, elongate, acute, diverging above the middle, about equal in length, upturned; **peduncle** 3-6 mm long, ca. 1.5 mm broad; **male flowers: florets** reduced, subsessile, usually 3 per inflorescence scale; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally; **filaments** very short, basally adnate to the tepals; **perianth** of 2 (4) minute, greenish, rounded tepals, usually bearing several conspicuous glands at the summit; **male inflorescences** slender, pendulous, subsessile, cylindric, densely bracteate catkins, 6-12 cm long, 5-9 mm broad at anthesis, composed of 3-flowered cymules sub-

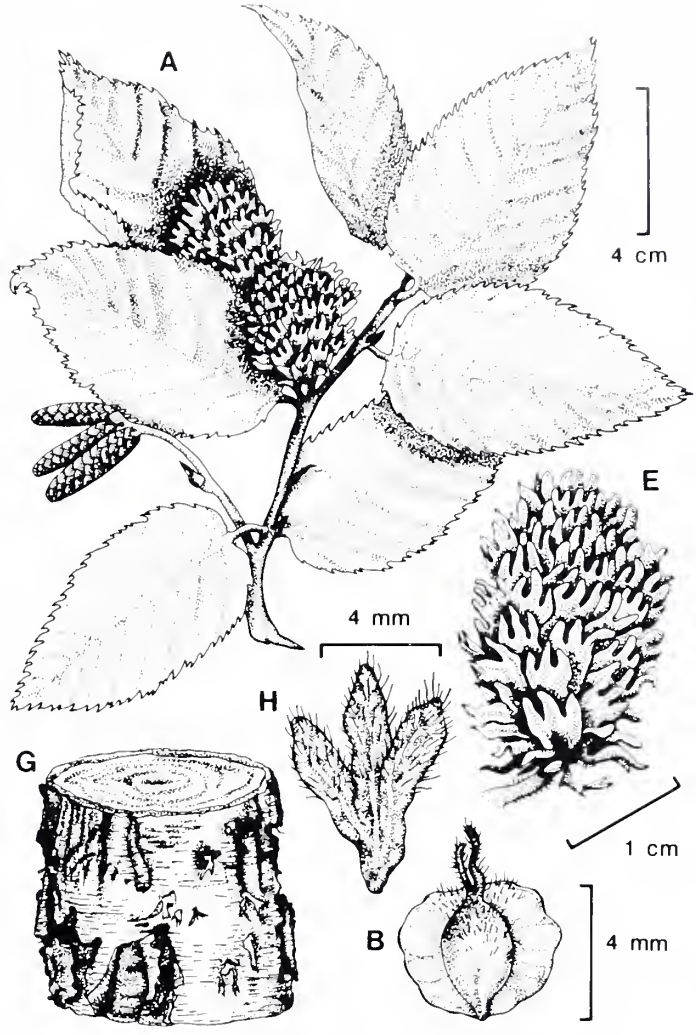
tended by 3 partially fused bracts, borne in clusters of (2) 3-4 at the ends of branchlets (not on short shoots), formed the season before blooming and exposed during the winter; **scales** (primary bracts) broadly ovate, acute; **peduncle** sparsely to moderately pubescent, 2-4 mm long, 1.0-1.2 mm broad; **leaves** alternate, subdistichous, usually borne on short shoots, blades firm, rhombic-ovate, coarsely doubly serrate to dentate, apex acuminate, the base cuneate to truncate, 4-8 cm long, 3-6 cm broad, upper surface glabrous, the lower moderately pubescent to tomentose, especially along the major veins and in vein axils, often with scattered, minute, resinous glands; **petioles** terete, 1.2-2.0 mm long, moderately to heavily pubescent; **fall color** yellowish to yellow-brown; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, more or less appressed, 5-10 mm long, 2-5 mm broad, the apex acute, **bud scales** numerous, imbricate, ovate, acute, smooth, brown; **stipules** broadly ovate, obtuse, 4-9 mm long, 3-5 mm broad, ciliate, green; **branches** subdistichous, usually showing fairly obvious long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, often with scattered resinous glands, light brown, with inconspicuous, brownish, elliptical **lenticels**; **leaf scars** raised, crescent-shaped to suboval, with 3 nearly evenly-spaced elliptical vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** of young trunks and branches smooth, relatively thin, tight, reddish to gray-brown with dark, horizontally expanded lenticels, grayish-brown, yellowish, or reddish and exfoliating irregularly in shaggy sheets when mature, the **lenticels** then darker, greatly expanded horizontally; **trunks** usually short, several in a cluster, often crooked and leaning, each up to ca. 50 cm in diameter (maximum ca. 1 m); **crown** broadly rounded, a medium-sized tree, the branching excurrent to deliquescent, 15-25 m tall; **root system** shallow, spreading ($2n = 28$).

Variation and Hybridization: These trees are not excessively variable in foliage or other features. They usually form clumps of several, large, leaning trunks along streambanks and on floodplains, though they attain a more upright posture when grown in the open. Hybrids have not been reported.

Importance: River birch is an important riverbank and floodplain tree throughout its range, serving, together with trees such as willows, cottonwoods and sycamores, to stabilize banks. In some situations, the plants have become a weedy pest, covering banks and clogging ditches and other small waterways. The tree is in little demand for use in wood products because of the high frequency of knots and other wood defects, but it has been used in limited quantities for making furniture, tool handles and small, turned items. Although it has not been extensively cultivated, this species is occasionally grown as a landscape or street tree for its interesting, multicolored, peeling bark. Several cultivars with whiter bark have recently been introduced into the horticultural trade.

Note: *Betula nigra* is a species of southeastern floristic affinity, ranging north to southern Illinois, southern Ohio, eastern Pennsylvania and extreme southeastern New York, and northward in the Mississippi Valley as far as Wisconsin and Minnesota. It is largely absent from the Southern Appalachians. Historical, disjunct populations occurred in Cayuga, Chemung and Oneida Counties, but these have apparently disappeared, as have populations on Long Island and in southeastern New Hampshire (see Coyle *et al.*, 1983). In the western part of its range (*e.g.*, Ohio and Illinois), *B. nigra* has been associated with highly acid conditions resulting from coal strip mining, but such a relationship has not been noted elsewhere.





2. *Betula alleghaniensis* Britt.

Common Names: Yellow Bireh, Common Bireh, Merisier (Quebec)

Type Description: Britton, Bull. Torrey Bot. Club 31: 166, 1904

Synonyms: *Betula alleghanensis* (in Britton & Brown, 1913), *B. lutea* Michx. f., *B. carpinifolia* Michx., not Ehrh., *B. lenta* ß. *lutea* (Michx. f.) Regel, *B. lutea* var. *alleghaniensis* (Britt.) Ashe, *B. lutea* var. *macrolepis* Fern.

Origin: Eastern North Ameriea

Habitats: Rieh, moist, eool forests, espeeially in the mountains; oeeurring at higher elevations to the south of our area

Habit: A tall, straight tree with a broad trunk and a rounded erown in the northern part of its range, smaller and more irregular to the south

Flowering: April-June

Fruiting: September-October

General Distribution: Southern Labrador to southeastern Manitoba, south to Tennessee and northern Georgia in the Appalaehians

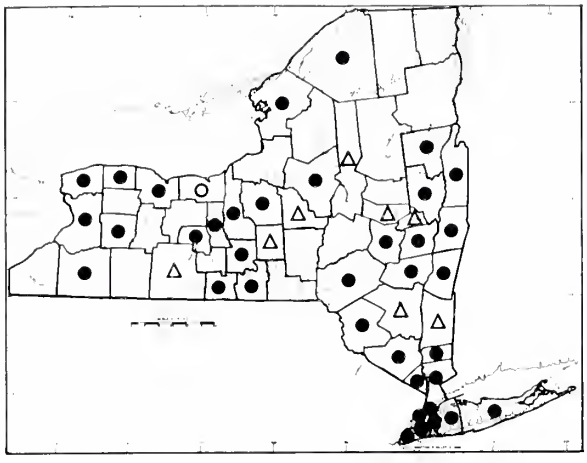
Description: Plants **monoecious**; **female flowers: florets** redueed, sessile, (2) 3 per infloreseenee seale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apieally stigmatie, red when reeeptive, 0.6-1.2 mm long; **ovary** 1 per floret, eylindrie, 2-loeular at the base, 1-loeular above, ea. 0.7 mm long, nude; **fruit** 3.0-4.5 mm long, 4.0-5.8 mm broad, the body obovoid, 2.3-3.4 mm broad, light brown, the wings narrower than the body, broadest at the summit, not or only slightly extending beyond the body apieally, 0.8-1.3 mm broad; 1 straight **seed** developing, filling the fruit, anatropous, with a membranaeeous testa and large, flat, fleshy eotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect, subsessile eylindrie densely bracteate eatkins, borne singly on short shoots below the males, 6-8 mm long, 1.5-2.5 mm broad at anthesis; **scales** (primary bracts) minute, 3-lobed; **peduncle** ca. 1 mm long, 1.5 mm broad; **fruiting catkins** erect, short-peduncled, ovoid to subglobose or short-eylindrie, densely-arranged, eone-like, 1.5-3.0 cm long, 1.0-2.5 cm broad, very dark brown at maturity, shattering with the fruits in fall or early winter; **scales** thiekened, somewhat woody, 3-lobed, 5-8 mm long, 4-8 mm broad at the apex, ciliate, sparsely to moderately pubeseent, the lobes diverging below the middle, upturned or partially extended, the central lobe tapering gradually to a narrow tip, longer than the limb, lateral lobes broader, rounded at the apex, equal in length to only slightly shorter than the eentral lobe; **peduncle** 2-8 mm long, 1.5-2.0 mm broad; **male flowers: florets** reduced, subsessile, usually 3 per scale in the infloreseenee; **stamens** 2 per floret, opposite the tepals; **anthers** eylindric, 2-ehambered, ea. 2 mm long, divided longitudinally into two separate 1-ehambered parts, dehiseing longitudinally; **filaments** very short, basally adnate to the tepals; **perianth** of 2 (4) minute, greenish tepals, rounded and usually bearing several eonspicuous glands at the apex; **male inflorescences** slender, pendulous subsessile, eylindric, densely braeteate eatkins, 5-10 cm long, 5-8 mm broad at anthesis, borne in clusters of 3-4 (5) at branchlet tips (not on

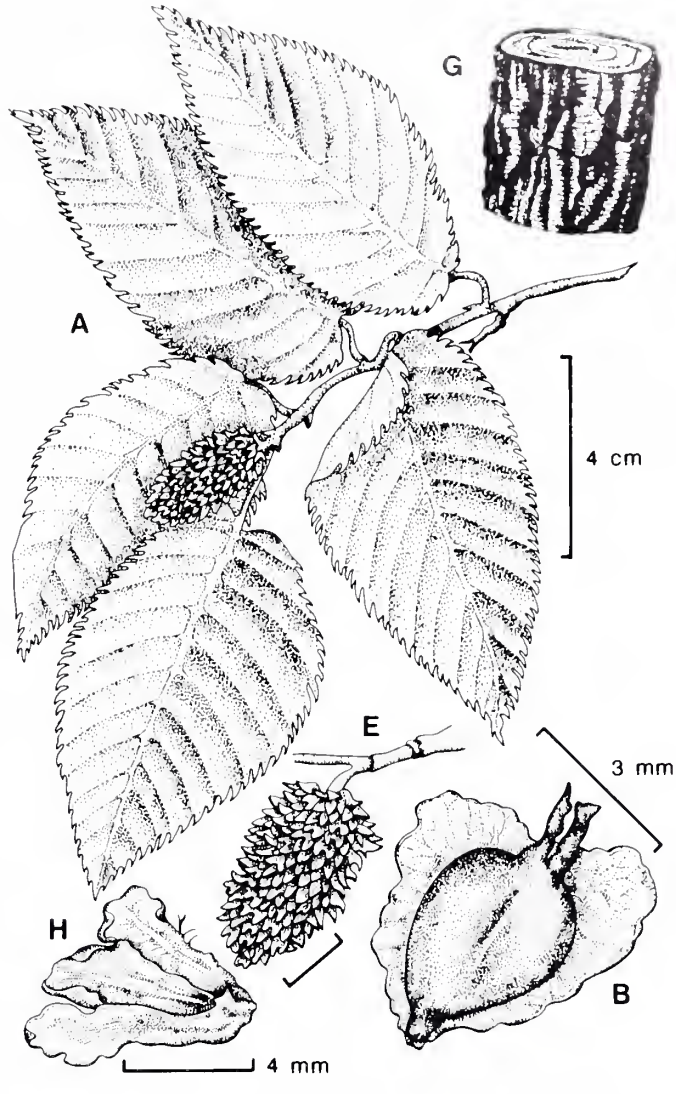
short shoots), formed the season before blooming and exposed during winter, composed of 3-flowered cymules subtended by 3 partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 1.5-3.0 mm long, 1.0-1.5 mm broad; **leaves** alternate, subdistichous, usually borne on short shoots, the blades thin, ovate to ovate-oblong, rather finely doubly serrate, the apex acuminate, the base rounded to cuneate, seldom cordate, 6-10 cm long, 3.0-5.5 cm broad, upper surface glabrous, the lower surface usually moderately pubescent, more heavily so along major veins and in vein axils, often with scattered, minute, resinous glands; **petioles** terete, 1.2-1.8 cm long, glabrous; **fall color** yellow or yellow-brown; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, appressed, 6-11 mm long, 2-6 mm broad, the apex acute to acuminate, **bud scales** numerous, imbricate, ovate, acute, smooth, reddish brown, only the outer 3 usually visible before shedding; **stipules** broadly elliptic, obtuse, 4-8 mm long, 3-4 mm broad, greenish; **branches** subdistichous, usually composed of obvious long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, often with scattered resinous glands, dark reddish brown, with pale, elliptical lenticels, containing a volatile, wintergreen oil; **leaf scars** raised, suboval, with 3 nearly evenly-spaced, oval vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** of young trunks and branches smooth, relatively thin, tight, pale reddish brown with dark, horizontally much-expanded **lenticels**, (bark) at maturity becoming tan, yellowish, or grayish and exfoliating in irregular sheets, thicker with age, and in great age, corky, deeply furrowed, dark brown to almost black; **trunk** usually 1, straight, usually to about 60 cm in diameter (maximum about 1.2 m); **crown** spreading, rounded, usually a medium sized tree, the branching deliquescent, 10-22 m tall (maximum ca. 30 m); **root system** shallow, spreading (2n = 84).

Variation and Hybridization: Yellow birch varies greatly in stature. In our area and in New England it becomes one of the largest trees of the northern hardwoods forest, sometimes reaching over 30 m in height with a trunk diameter over 1.5 m. To the west and south, however, these trees are characteristically smaller, usually attaining only 9 or 10 m, or taking on a dwarfed, shrub-like aspect. The creamy or light yellow-brown peeling bark is usually diagnostic, serving as the easiest field character to separate it from *B. lenta*. However, this trait is not always reliable, and the bark may sometimes be very dark and tight (*B. lutea* var. *falax* Fassett). The scales of the fruiting catkins vary greatly in size and texture, ranging from smallish and rather woody (5-8 mm long) to much larger and more or less foliaceous (up to 15 mm long in var. *macrolepis* Fern.). There is little consistency or geographical correlation with this variation, however. *Betula alleghaniensis* hybridizes readily with *B. lenta* wherever these two species occur together, and also with *B. pumila* (producing *B.* × *purpusii* Schneid.). The progeny of these crosses have intermediate leaf, cone-scale and habit characters.

Importance: *Betula alleghaniensis* is regarded as our most important birch for wood production. In the North, its trunks become straight and tall, their moderately heavy, strong, close-grained wood being used for the manufacture of many items including inexpensive furniture, cabinets, doors, window frames, interior molding, flooring, paneling and turned items. It is also used locally for firewood and other utility purposes. This species is one of the most characteristic hardwood trees of the northern mixed hardwood vegetation, and, as such, it plays a dominant ecological role. In recent decades a decline of yellow birch populations in the Northeast (especially in the Maritime Provinces and northern New England) has been attributed to post-logging decadence, brought on by the opening of the habitat and by birch dieback, an incompletely understood malady related (but not entirely attributable to) infestation by the bronze birch borer, *Agrilus anxius*. The species is also attacked significantly but the birch skeletonizer, *Bacculatrix canadensisella*, the gypsy moth, *Lymantria dispar* (*Porthetria dispar*) and by various heart rots (*Fomes* spp.) and stem cankers (*Nectria* spp.; *Poria* spp.), and these pests result in significant losses to the timber industry annually.

Note: Yellow birch, in suitable habitats, becomes one of our largest and most beautiful forest trees. It was known for many years as *Betula lutea* Michx. f., but that name has been shown to be illegitimate under the international rules of botanical nomenclature (see Brayshaw, 1966a). Its leaves resemble those of *B. lenta* but are more coarsely toothed and more obviously doubly serrate. The most reliable character for separating these two species is the pubescence of the fruiting catkin scales; the scales of *B. lenta* have no pubescence and those of *B. alleghaniensis* are at least partially pubescent or ciliate-margined.





3. *Betula lenta* L.

Common Names: Sweet Birch, Cherry Birch, Black Birch, Merisier Rouge (Quebec)

Type Description: Species Pl. II, p. 983, 1753

Synonym: *Betula carpinifolia* Ehrh.

Origin: Eastern North America

Habitats: Rich, moist woods or swampy floodplains; sometimes on dry or rocky slopes; in New York, mainly in the central and southeastern parts of the State and on Long Island

Habit: A tall tree with a broad, straight bole and a rounded crown

Flowering: Mid April-May

Fruiting: August-September

General Distribution: Southwestern Maine to southern Quebec and eastern Ontario, south to Kentucky, Tennessee, northern Alabama and Georgia in the Appalachians

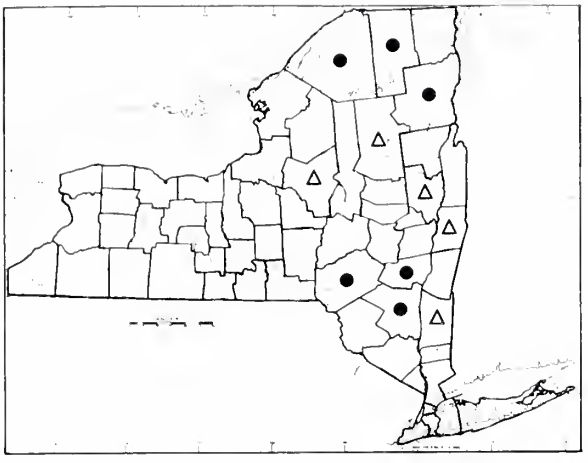
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.6-1.2 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.7 mm long, nude; **fruit** 3-4 (4.5) mm long, 3.5-5.0 mm broad, the body obovoid, 1.8-3.0 mm broad, light brown, the wings narrower than the body, elliptic, broadest near the center, not extending beyond the body apically, 0.8-1.2 mm broad; 1 straight **seed** developing, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect subsessile cylindric densely bracteate catkins, borne singly on short shoots below the males, 4-6 mm long, 1-2 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, ca. 1 mm long; **fruiting catkins** erect, short-peduncled, short-cylindric, densely-arranged, cone-like, 1.5-3.5 cm long, 1.0-2.5 cm broad, becoming dark brown and shattering with the fruits in fall or early winter; **scales** thickened, somewhat woody, 3-lobed, 5-7 mm long, 6-9 mm broad at the apex, lobes diverging above the middle, extended to upturned, central lobe short, moderately broad, wedge-shaped, shorter than the limb, lateral lobes broader, longer than the central lobe; **peduncle** 2-6 mm long, ca. 1 mm broad; **male flowers: florets** reduced, subsessile, usually 3 per scale in the inflorescence; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally; **filaments** very short, basally adnate to the tepals; **perianth** usually of 2 minute, greenish tepals, rounded, usually bearing several conspicuous glands at the summit; **male inflorescences** slender, pendulous cylindric, densely bracteate catkins, 5-10 cm long, 5-8 mm broad at anthesis, composed of 3-flowered cymules subtended by 3 partially fused braets, borne in clusters of 3-4 at the ends of branchlets (not on short shoots), formed the season before blooming and exposed in winter; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 1.5-3.0 mm long, 1.0-1.5 mm broad; **leaves** alternate, subdistichous, usually borne on short shoots, the blades thin, ovate to ovate-oblong, 5-10 cm long, 3-6 cm broad, finely

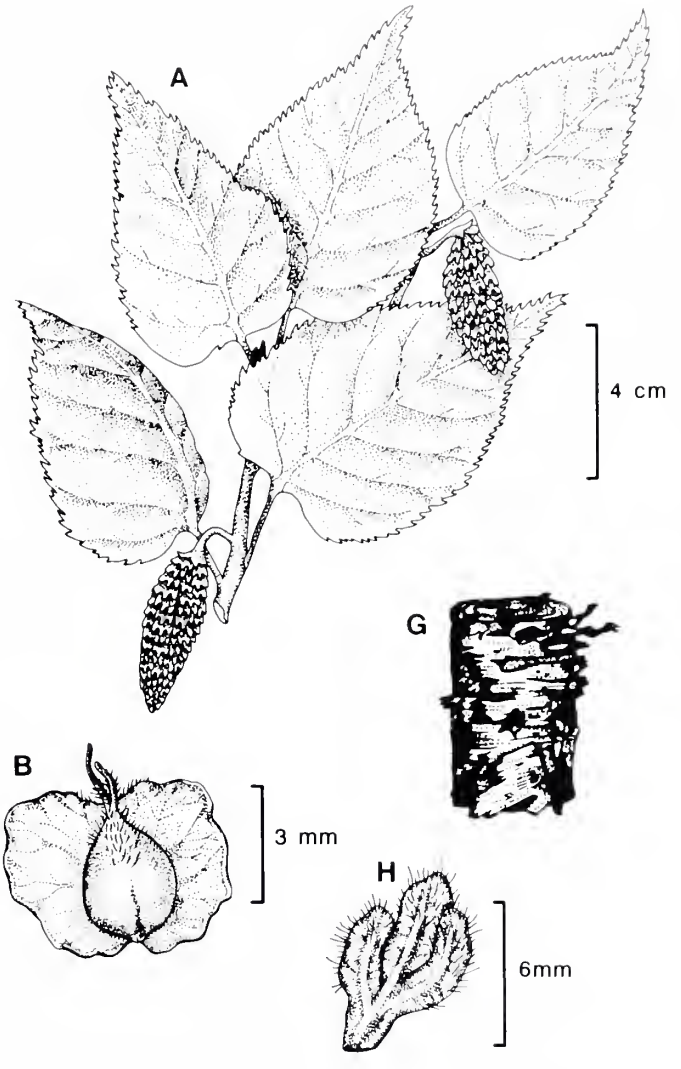
and sharply (sometimes rather obscurely) doubly serrate, apex acuminate, the base rounded to cordate, upper surface glabrous, the lower mostly glabrous except sparsely to moderately pubescent (tomentose) along major veins and in vein axils, often with scattered, minute, resinous glands; **petioles** short, terete, 0.8-1.5 cm long, glabrous; **fall color** yellow or yellow-brown; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, appressed, 7-11 mm long, 2-6 mm broad, the apex acuminate, **bud scales** numerous, imbricate, ovate, acuminate, smooth, dark reddish brown; **stipules** broadly ovate, obtuse, 4-8 mm long, 3-4 mm broad, greenish; **branches** subdistichous, usually composed of obvious long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, often with scattered resinous glands, dark reddish brown, with inconspicuous elliptical lenticels, containing volatile wintergreen oil; **leaf scars** somewhat raised, crescent-shaped to suboval with 3 nearly evenly-spaced elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, relatively thin, tight, light grayish brown, with dark horizontally expanded **lenticels**, broken and furrowed with age; **trunk** usually 1, straight, to ca. 60 cm in diameter (maximum ca. 1 m d.b.h.); **crown** broadly pyramidal to rounded, branching excurrent, becoming deliquescent, a medium-sized to large tree, up to 20 m tall; **root system** shallow, spreading (2n = 28).

Variation and Hybridization: *Betula lenta* is not excessively variable, either in foliage, bark, or fruit characteristics. It has been shown to hybridize with *B. alleghaniensis* where it comes in contact with it, and with *B. pumila* (producing *B.* × *jackii* Schneid.); the resulting progeny in both cases demonstrate intermediate characters.

Importance: Sweet birch is an important timber tree in the Northeast. It has wood similar to that of yellow birch, used to make many of the same wood products, including cabinets, interior moldings, doors and window frames, wood paneling, flooring, furniture and other items. In the past, the wood was also used for shipbuilding in the Maritime region, and it was in great demand as the primary source of wintergreen oil, used medicinally and as a flavoring. The oil was obtained by cutting and chipping small trees and then distilling the wood, which yielded about four pounds of oil per ton of wood. The main component of the oil, methyl salicylate, is now produced synthetically. The sap contains a high percentage of sugar, and trees are sometimes tapped in the spring like sugar maples. The sap is boiled down into a syrup (by itself or with added ingredients) and allowed to ferment to make a naturally carbonated birch beer. *Betula lenta* is an important canopy component of the Northern Hardwood association throughout the moist forests of the Appalachian Mountains. It is attacked by many of the same insect pests as *B. alleghaniensis*, including the bronze birch borer and the gypsy moth, and the wood is damaged by fungi like heart rot (*Fomes* sp.) and stem canker (*Nectria* sp.), resulting in significant economic losses to the wood products industry (see Appendices I, II).

Note: *Betula lenta* is a tree of primarily Appalachian distribution, but it also occurs on the Coastal Plain in southern New England and in the lowlands along the southern Great Lakes. It is found in greatest abundance in our area and in New England, attaining large size, both here and in the Southern Appalachians. Sweet birch is most common across the central part of New York State, becoming less frequent to the north in the Adirondacks. It will grow on a wide variety of soil types, sometimes including rocky or shallow substrates, but it is regarded as relatively intolerant to competition. The leaves are elliptic-ovate and resemble those of *B. alleghaniensis* except that they are more coarsely toothed. The bark is tight and generally very dark in mature individuals, distinguishing it from the yellow birch. The fruiting catkin scales are different from our other species in that they are essentially glabrous.





4. *Betula cordifolia* Regel

Common Names: Heartleaf Birch, Mountain White Birch

Type Description: Regel, Nouv. Mem. Soc. Nat. Mosc. 18: 86, 1861

Synonyms: *B. papyrifera* var. *cordifolia* (Regel) Fern., *B. papyracea* var. *cordifolia* (Regel) Dipple, *B. alba* var. *cordifolia* (Regel) Fern.

Origin: Eastern North America

Habitats: Moist, rocky slopes, especially in the Adirondacks at elevations above 2,400 ft

Habit: A medium-sized tree, generally with a single, straight trunk and pyramidal crown

Flowering: Late May-June

Fruiting: September-October

General Distribution: Labrador to central Ontario, northern Michigan and Wisconsin south to New England, northern New York and mountainous North Carolina

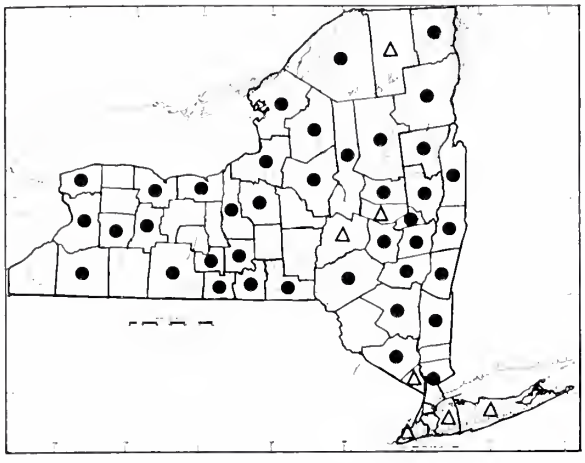
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, red when receptive, 0.8-1.8 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.7 mm long, nude; **fruit** 2.3-4.0 mm long, 5.5-8.7 mm broad, the body (ovoid) ellipsoid, 1.7-3.0 mm broad, the wings a little broader than the body, widest at the summit, extending beyond the body apically, 1.8-3.5 mm broad; 1 straight **seed** developing, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences:** erect, subsessile cylindric, densely-arranged bracteate catkins, borne singly on short shoots below the males, 1.6-2.8 cm long, 4-6 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, 3-5 mm long; **fruiting catkins** pendulous or subpendulous, short-peduncled, cylindric, dense, cone-like, 2.5-5.5 cm long, 6-10 mm broad, becoming light brown, shattering with the fruits in fall or early winter; **scales** coriaceous to somewhat woody, 3-lobed, 5.6-8.7 mm long, 4.0-5.4 mm broad at the apex, ciliate, glabrous to moderately pubescent, the lobes divergent below the middle, upturned, the central lobe elongate with more or less parallel sides and an obtuse tip, somewhat longer than the base, the lateral lobes a little broader, rounded at the tip, shorter than the central lobe; **peduncle** 6-12 mm long, 1.0-1.5 mm broad; **male flowers: florets** reduced, subsessile, usually 3 per inflorescence scale; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally at anthesis; **filaments** very short, basally adnate to the tepals; **perianth** of (1) 2 (4) minute, greenish, tepals, rounded and usually bearing several conspicuous glands at the summit; **male inflorescences** slender, pendulous, subsessile, cylindric, densely bracteate catkins, 7-12 cm long, 6-12 mm broad at anthesis, borne (singly or) in clusters 2-4 at branchlet tips (not on short shoots), formed the season before blooming and exposed during winter, composed of 3-flowered cymules subtended by 3 partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 6-10 mm long, 0.8-1.5 mm broad; **leaves** alter-

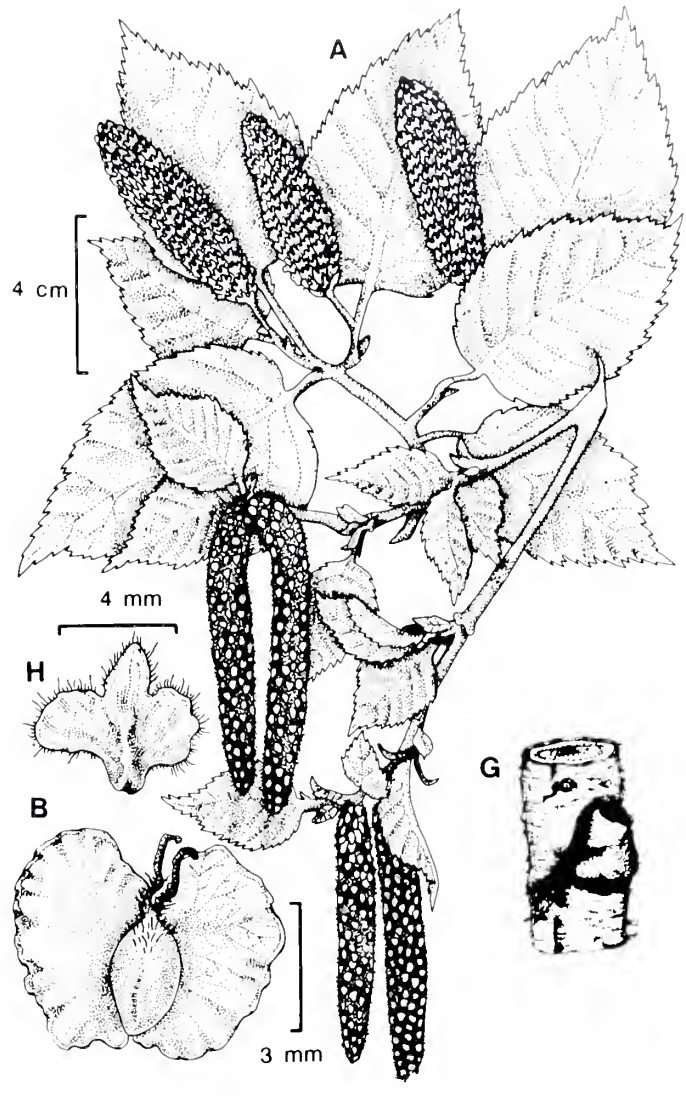
nate, subdistichous, usually borne on short shoots, the blades thin, narrowly ovate to ovate, (3) 6-10 (14) cm long, (3) 4.0-7.5 (9) cm broad, coarsely, irregularly or sometimes obscurely doubly serrate, apex acuminate, the base usually cordate, upper surface glabrous, the lower sparsely to moderately pubescent, often tomentose along the major veins and in vein axils, with minute, scattered, resinous glands; **petioles** terete, 1.8-3.0 cm long, glabrous; **fall color** yellowish to golden brown; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, appressed at the base, 8-13 mm long, 2.0-5.5 mm broad, the apex acuminate, **bud scales** numerous, imbricate, ovate, acuminate, smooth, brownish red, only the outer 3 usually visible before shedding; **stipules** broadly ovate, obtuse, 3-9 mm long, 3-4 mm broad, greenish or light brown; **branches** subdistichous, usually composed of obvious long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, often with scattered, resinous glands, dark reddish brown with prominent, pale, elliptic lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval with 3 nearly evenly-spaced elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, relatively thin, tight when young, dark reddish brown, with pale horizontally expanding lenticels, mature bark white, or creamy or tan to deep bronze, exfoliating in paper-thin sheets that may fall in sheaths, **lenticels** dark, greatly expanded horizontally; **trunks** 1 to several, usually somewhat crooked or leaning, to 45 cm in diameter (maximum about 60 cm); **crown** broadly pyramidal to rounded, a tree or large irregular shrub, the branching usually excurrent, becoming deliquescent in age, up to 15 (25) m tall; **root system** shallow, spreading (2n = 28, 56).

Variation and Hybridization: *Betula cordifolia* has been shown to hybridize with *B. populifolia* where they occur together. The hybrids produced are known as the blue birches, *B.* × *caerulea* Blanch. One of these, the "large blue birch," once called *B. caerulea-grandis* Blanch., has fruiting catkins and scales closely resembling those of *B. populifolia*, leaves intermediate in form, and exfoliating white bark. (see additional comments under *B. populifolia* below). *Betula cordifolia* is also a putative parent of *B. minor* Tuckerm., a possible direct or allopolyploid derivative of hybridization between it and *B. glandulosa* (see the discussion under *B. minor*).

Importance: The wood of *Betula cordifolia* is used interchangeably with that of *B. papyrifera*. The tree is important as a component of the mixed hardwoods forest at upper elevations, affording wildlife habitat and erosion protection on mountain slopes.

Note: *Betula cordifolia*, often treated as a variety of *B. papyrifera*, is a (mostly) diploid, high elevation, northern vicariant of that species. In our range it occurs mostly above 2,400 ft; it is common throughout the Adirondacks. *Betula cordifolia* is a tree of similar stature and habit to *B. papyrifera*, though at very high elevations it becomes somewhat dwarfed. It can be distinguished most easily from *B. papyrifera* by its cordate leaf bases and blades with 9 or more lateral veins (*B. papyrifera* normally has rounded to truncate leaf bases and 9 or fewer lateral veins). The mature bark is bronze to golden-brown or white, with a pronounced reddish or yellowish tinge in contrast to the chalk white and pinkish tones of *B. papyrifera*. The two species also differ in their fruiting catkin scales, the central lobe being longer with more parallel sides and the fruit wings being somewhat wider in *B. cordifolia*, but in most other characters the two species overlap.





5. *Betula papyrifera* Marsh.

Common Names: Paper Birch, Canoe Birch, White Birch, Birch, Bouleau Blanc (Quebec)

Type Description: Marshall, Arbust. Amer. p. 19, 1785

Synonyms: *Betula papyracea* Ait., *B. alba* var. *papyrifera* (Marsh.) Spach, *B. latifolia* Tausch

Origin: Northern North America

Habitats: Moist more or less open forest, especially on rocky slopes, but also sometimes in swampy woods; common in the Adirondacks and the northern counties of the State

Habit: A medium-sized tree, usually with a single straight trunk branching more or less excurrently

Flowering: Late April-June

Fruiting: September-October

General Distribution: Ranging across the Continent from northern Labrador west to Alaska, south to northern Washington and Idaho, southern Manitoba, central Alberta, southeast to New England, central New York and Pennsylvania

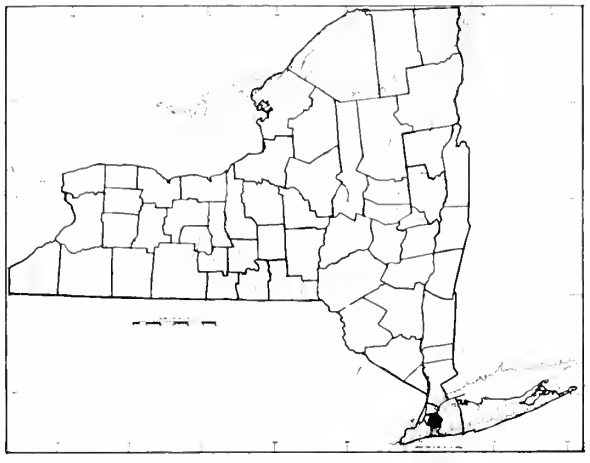
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, bright red when receptive, 0.8-1.8 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, nude; **fruit** 1.9-3.4 mm long, 3.5-5.5 mm broad, the body (ovoid) ellipsoid, 1.5-2.8 mm broad, light brown, the wings as broad as or broader than the body, widest near the summit, extending slightly beyond the body apically, 0.9-1.5 mm broad; only 1 **seed** developing, this straight, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescence** an erect, subsessile, cylindric, dense, bracteate catkin, borne singly on short shoots below the males, 15-25 mm long, 4-6 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, 2-6 mm long; **fruiting catkins** pendulous to subpendulous, short-peduncled, cylindric, densely-arranged, cone-like, (1.5) 2.5-3.2 (6.5) cm long, 6-10 (12) mm broad, becoming light brown and shattering with the fruits in fall or early winter; **scales** coriaceous to somewhat woody, 3- lobed, 3.9-6.2 mm long, 2.5-6.2 mm broad at the apex, ciliate, pubescent to glabrous, the lobes divergent below the middle, strongly extended, the central lobe oblong to ovate, acute to obtuse, a little longer than the base, the lateral lobes about equal in length to the central lobe but 2 or 3 times broader, wider near the apex, rounded or angular to subrhombic; **peduncle** 0.7-2.0 cm long, 1.0-1.5 mm broad; **male flowers: florets** reduced, subsessile, usually 3 per inflorescence scale; **stamens** (1) 2 (4) per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally at anthesis; **filaments** very short, basally adnate to the tepals; **perianth** of 2 minute, greenish tepals, these rounded, usually bearing several conspicuous glands at the summit; **male inflorescence** a slender, pendulous, subsessile, cylindric, densely bracteate catkin, (5) 7-10 cm long, 7-12 mm broad at anthesis, borne in clusters

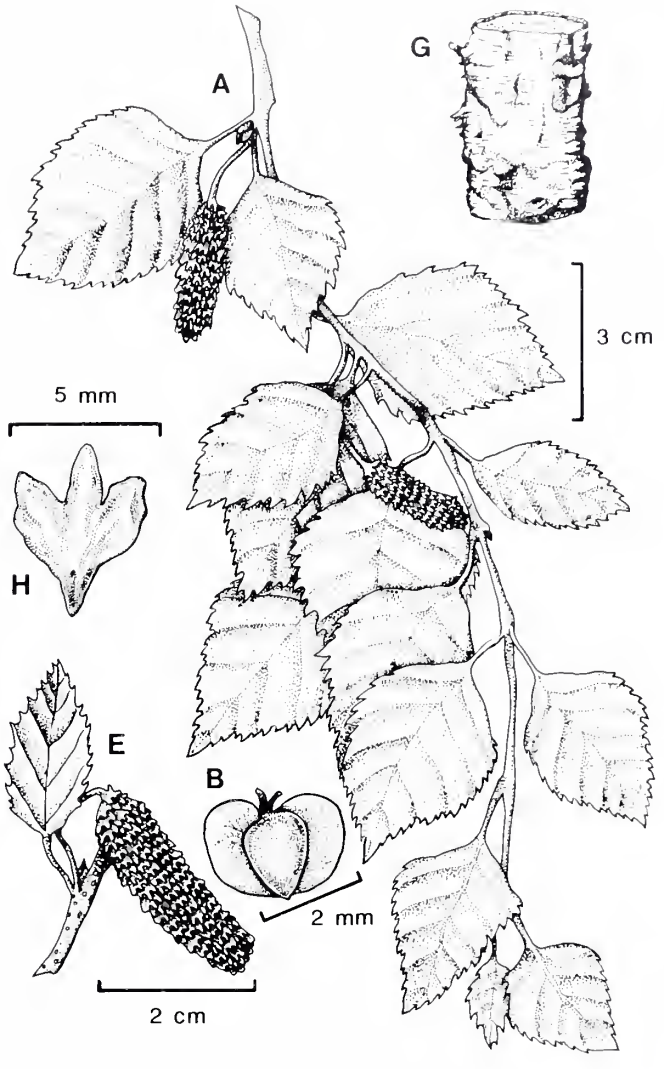
of 2-4 (rarely singly) at the ends of branchlets (not on short shoots), developing the season before blooming and exposed during winter, composed of 3-flowered cymules subtended by 3 partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 5-10 mm long, ca. 1 mm broad; **leaves** alternate, subdistichous, usually borne on short shoots, the blades firm, ovate to elliptic or elliptic-oblong, (2.5) 5.5-9.0 (12) cm long, (2) 4.0-6.5 (8.5) cm broad, coarsely, irregularly, or sometimes obscurely doubly serrate or serrate-dentate, apex acuminate, the base rounded, cuneate, or truncate, upper surface glabrous, lower surface sparsely to moderately pubescent, often tomentose along the major veins and in vein axils, with scattered, minute, resinous glands; **petioles** slender, terete, 1.5-2.6 cm long, glabrous; **fall color** yellow; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, appressed at the base, 8-12 mm long, 2-5 mm broad, the apex acute to acuminate, **bud scales** numerous, imbricate, ovate, acuminate, smooth, brownish red, only the outer 3 usually visible before shedding; **stipules** broadly ovate, obtuse, 2-8 mm long, 3-4 mm broad, ciliate, greenish or light brown; **branches** subdistichous, usually composed of obvious long and short shoots; young **twigs** terete, moderately pubescent, often with scattered resinous glands, dark reddish-brown, with prominent pale, elliptic lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval, with 3 nearly evenly-spaced, elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, relatively thin, tight when young, dark reddish-brown with pale, horizontally expanded lenticels, thicker and creamy or pinkish white to chalky white when mature, exfoliating in paper-thin sheets, **lenticels** becoming dark, greatly expanded horizontally; **trunks** 1 to several, crooked or leaning, to 20-50 cm in diameter (maximum about 1 m); **crown** broadly pyramidal to rounded, a tree or large irregular shrub, the branches ascending and spreading, somewhat pendulous at the tips, excurrent, becoming deliquescent in age, up to 30 m tall; **root system** shallow, spreading (2n = 56, 70, 84).

Variation and Hybridization: The paper birch is an extremely variable species. Six varieties (three occurring within in our range) as well as several forms are recognized in Gray's Manual; however, none of these (except "var. *cordifolia*," treated here as a separate species) seems distinct or consistent enough to warrant inclusion here. The leaves vary from thin and submembranaceous to quite thick and leathery; the blades, which are usually (but not always) quite pubescent, range from ovate to more or less oblong. The crown of the tree usually consists of spreading or upright branches, but these become pendulous to varying degrees in some trees (var. *pensilis* Fern.). The bark, a dark red-brown at first, exfoliates on mature trunks and branches to reveal a characteristic creamy-white underbark, but the age and degree of this exfoliation is also variable, as are the length of the fruiting catkins and their peduncles. The central lobe of the fruiting catkins scales is often much narrower and somewhat longer than the side lobes and longer than the limb of the scale base, but in different scales this varies, the central lobe sometimes appearing about as broad as the side lobes and much shorter than the side lobes or the base. Nevertheless, the central lobe is never as short as the nub-like central lobe of the scales of *B. populifolia*. *Betula papyrifera* hybridizes with *B. populifolia* where the two species come in contact, sometimes giving rise to extensive hybrid swarms. It is also known to cross with *B. pumila*, producing intermediate plants known as *B.* × *sandbergii* Britt.

Importance: Wood of the paper birch is lighter and softer than that of yellow birch. Nevertheless, *Betula papyrifera* is an important tree for pulpwood and for making small wooden products such as clothes pins, spools, ice cream sticks and toothpicks. It was formerly prized for cabinetry, but has not been widely used for this purpose in recent years. The Indians of northern North America used the strong, waterproof bark for a wide variety of building and wrapping purposes, including coverings for dwellings, bundles, canoes and shoes. Much of northern America was explored by Europeans using birch bark canoes. *Betula papyrifera* serves as winter browse for deer, moose and other large herbivores, and birds and small mammals feed heavily on the fruits. In times of starvation, humans, both in Eurasia and North America, have survived for extended periods using the oil-rich bark of white birches as a food source. The Indians also used the bark of this species, like that of other birches and the alders, as a source of astringent medications. Paper birches are important in plant succession, since their seedlings come up quickly after fires, logging disturbance and the abandonment of cultivated land. Unlike some successional elements, they may remain as a component of the mature, mixed hardwood forest. Paper birch has found limited use as an ornamental tree, although *B. pendula* is by far the more commonly cultivated white-barked birch species in our area.

Note: The paper birch is one of our most familiar northern trees, with its white, usually single trunks with peeling, paper-like bark. It is a tree of cool climates, usually occurring only where the average July temperature remains below 70°F. In our area, it is common throughout the Adirondack region and the northern part of the State, mostly below an elevation of 800 m, above which it is replaced by *B. cordifolia*. *Betula cordifolia* can readily be distinguished from *B. papyrifera* by its leaves, which have cordate bases and 9-12 pairs of lateral veins, as opposed to rounded or truncate bases and only 5-9 pairs of lateral veins. The mature bark of *B. papyrifera* is a creamy to chalky white, while that of *B. cordifolia* is white, but with a bronze to rosy or pinkish-tan cast. Paper birch is easily distinguished from our other common white-barked species, the gray birch (*Betula populifolia*) by its peeling bark and by the leaves, which have greatly drawn-out tips in the latter. In the past, *B. papyrifera* was widely considered to represent a variety of the European species *B. alba* L. (now called *B. pubescens* Ehrh.), and many names in books, on herbarium specimens, and in the nursery trade cite the name *B. alba*. In this country, these almost always refer to *B. papyrifera*. *Betula pubescens* is sometimes grown in this country, but it does not often persist long outside of cultivation (see below).





6. *Betula pubescens* Ehrh.

Common Names: European Birch, Downy Bireh

Type Description: Ehrhart, Beitr. Naturk. 5: 160, 1790

Synonyms: *Betula alba* L., *B. odorata* Beehst.

Origin: Northern Europe

Habitats: Abandoned plantings moist, open roadsides, swales and swampy thickets

Habit: A small to medium-sized tree, usually with a single trunk and aseending, more or less exeurrent branehes

Flowering: April-June

Fruiting: September-Oetober

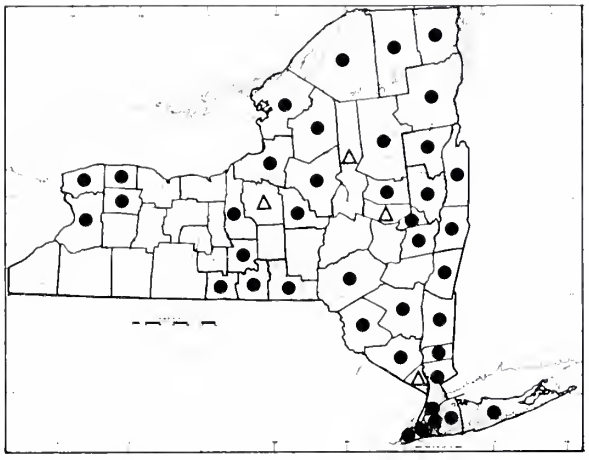
General Distribution: Throughout northern and eentral Europe and southward at higher elevations in the Alps and other mountain ehains, extending eastward in northern eentral Asia to eentral Siberia. In the eastern United States oeeasionally persisting or adventive after eultivation, although evidently not widely spreading or naturalizing.

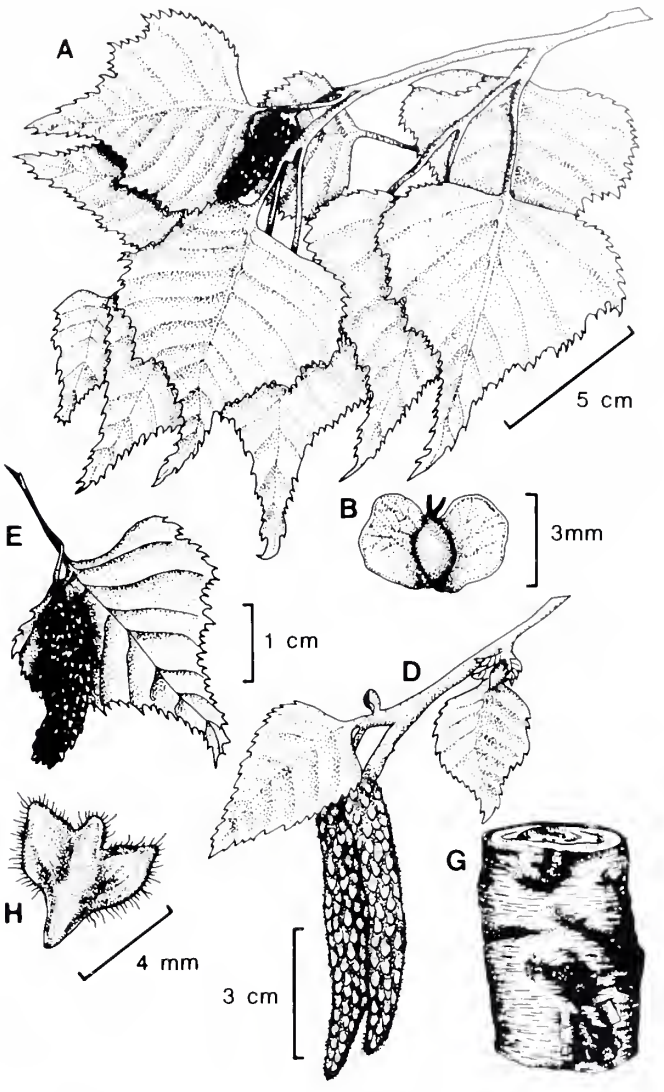
Description: Plants **monoecious**; **female flowers: florets** redueed, sessile, (2) 3 per inflorescence seale; **styles** 2, free, linear, apieally stigmatie, red when receptive, 0.5-1.5 mm long; **ovary** 1 per floret, eylindrie, 2-loeular at the base, 1-loeular above, ea. 0.5 mm long, nude; **fruit** (1.5) 1.8-2.5 (3) mm long, 3.5-7.0 mm broad, the body ovoid to ellipsoid, 1.2-2.5 mm broad, light brown, the wings somewhat broader than the body, widest near the summit, extending beyond the body apieally, 1.5-3.0 mm broad; only 1 **seed** developing, this straight, filling the fruit, anatropous, with a membranaeeous testa and large, flat, fleshy eotyledons, partially overlapping and enelosing the short stalk; **perianth** absent; **female inflorescence** an erect, subsessile, eylindrie, dense, braeteate eatkin, borne singly on short shoots below the males, 15-25 mm long, 4-6 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, 2-6 mm long; **fruiting catkins** pendulous or subpendulous, short-peduncled, eylindrie, densely-arranged, cone-like, (2) 3-4 (5) cm long, 8-12 mm broad, beeoming light brown and shattering with the fruits in fall or early winter; **scales** coriaeeous to somewhat woody, 3 lobed, 3-6 mm long, 3.0-5.5 mm broad at the apex, ciliate, pubeseent, the lobes divergent about at the middle of the seale, extended outward at right angles to the axis, the eentral lobe oblong to ovate, aeute to obtuse, usually about equal in length to the base, the lateral lobes about equal in length to the eentral lobe but several times broader, wider near the apex, rounded to angular; **peduncle** 0.5-2.0 cm long, 1.0-1.5 mm broad; **male flowers: florets** redueed, subsessile, usually 3 per inflorescence scale; **stamens** (1) 2 (4) per floret, opposite the tepals; **anthers** eylindrie, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-ehambered parts, dehiseing longitudinally at anthesis; **filaments** very short, basally adnate to the tepals; **perianth** of 2 minute, greenish tepals, these rounded, usually bearing several eonspieuous glands at the summit; **male inflorescence** a slender, pendulous, subsessile, eylindrie, densely braeteate catkin, (5) 6-8 em long, 5-8 mm broad at anthesis, borne in elusters of 2-3 (rarely singly) at the ends of branchlets (not on short shoots), developing the season before blooming and exposed during winter, composed of 3-flowered

cymules subtended by 3 partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 4-8 mm long, ca. 1 mm broad; **leaves** alternate, subdistichous, usually borne on short shoots, the blades moderately firm, broadly ovate to rhombic-ovate, (3) 4-5 (6) cm long, (1.5) 2-4 (6) cm broad, often coarsely and irregularly toothed to dentate, though sometimes more finely so, the apex acute, the base broadly rounded, truncate, or (less often) cuneate, both surfaces moderately to densely pubescent when young, puberulent or glabrous later, the lower surface sometimes moderately to densely hairy along the major veins and in vein axils; **petioles** slender, terete, 1.0-2.5 cm long, pubescent; **fall color** yellow or yellowish brown; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, 5-10 mm long, 2-5 mm broad, the apex acute to acuminate, **bud scales** numerous, imbricate, ovate, acuminate, smooth, brownish red, only the outer 3 usually visible before shedding; **stipules** broadly ovate, obtuse, 2-5 mm long, 3-4 mm broad, ciliate, greenish or light brown; **branches** subdistichous, usually composed of obvious long and short shoots; young **twigs** terete, covered with scattered short bristly hairs, lacking prominent warty resinous glands (except in subsp. *carpatica* of arctic and alpine Europe), reddish brown, with light elliptic lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval, with 3 nearly evenly-spaced, elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, relatively thin, tight when young, dark reddish brown with light, horizontally expanded lenticels, light brown to brownish white when mature, tight or exfoliating in thin sheets, becoming black and rough near the base; **lenticels** becoming dark, greatly expanded horizontally; **trunk** usually 1, often somewhat crooked, to about 70 cm in diameter; **crown** broadly pyramidal or columnar to rounded, a small tree or tall shrub, the branches ascending and spreading, excurrent, becoming deliquescent in age, up to 20 m tall; **root system** shallow, spreading ($2n = 56$).

Variation and Hybridization: The European birch is even more variable in leaf shape, pubescence and fruit and cone scale size and shape, than is *B. papyrifera*, to which it is closely related. In Europe, the extreme variability of *B. pubescens* has been studied by botanists for over a hundred years, and this has led to the recognition and naming of scores of species and varieties over that period of time. All of these variants were consolidated into two subspecies in *Flora Europaea*, but that treatment has not completely satisfied taxonomists familiar with the group. Even though *B. pubescens* and *B. papyrifera* can usually be distinguished on the basis of the smaller leaves and coarser leaf teeth in *B. pubescens*, individual leaves of *B. pubescens* closely matching those of typical *B. papyrifera* are not uncommon. The morphological variability in these two species was studied and discussed in detail by Fernald (1902). *Betula pubescens* is known to hybridize with both *B. papyrifera* and *B. populifolia*, as well as with the cultivated *B. pendula*, with which it occurs naturally in Europe. There, extensive and cytogenetically complex hybrid swarms involving *B. pubescens* and *B. pendula* create considerable difficulty for those seeking to identify the native wild birches.

Importance: The European birch has been domesticated for centuries and is occasionally cultivated in the Northeast (usually, as with *Betula pendula*, under the name *B. alba*). However, it is not nearly so common in the mass trade as is *B. pendula*, which has whiter bark and a more pendulous habit. Several cultivars, including cut-leaved, small-leaved and shrubby forms are marketed. In Europe, the white birch is widely used in the same ways as is *B. papyrifera* in this country.





7. *Betula populifolia* Marsh.

Common Names: Gray Birch, White Birch, Fire Birch, Old-field Birch, Birch, Bouleau Rouge (Quebec)

Type Description: Marshall, Arbust. Amer. p. 19, 1785

Synonyms: *Betula alba* var. *populifolia* (Marsh.) Spach, *B. excelsa canadensis* Wang.

Origin: Eastern North America

Habitats: Infertile, often rocky or sandy, dry to wet soil, dry forests, pine barrens and roadsides; common at lower elevations

Habit: A small to medium-sized tree, often with several trunks, forming a spreading clump

Flowering: April-May

Fruiting: August-October

General Distribution: Southern Quebec west to southwestern Ontario, south to Delaware, Pennsylvania, northern Ohio with outliers to northern Indiana and in the Appalachians south to North Carolina

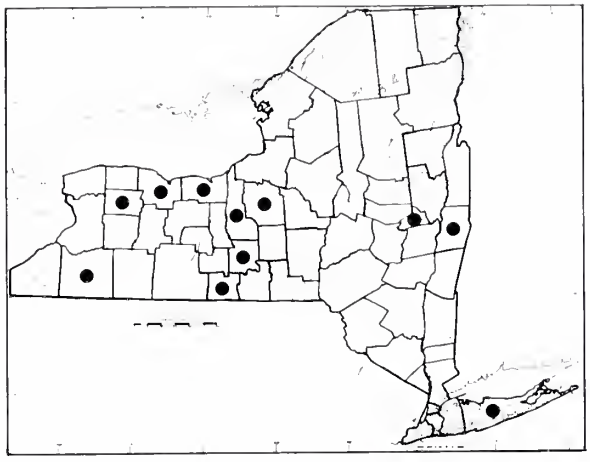
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, bright red when receptive, 0.7-1.8 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.7 mm long, nude; **fruit** 2.2-3.0 mm long, 2.5-4.5 mm broad, the body ellipsoid, 1.0-1.5 mm broad, light brown, the wings broader than the body, broadest near the center, extending beyond the body apically, 0.8-1.5 mm broad; only 1 **seed** developing, this, straight, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect, peduncled, cylindric, bracteate catkins, borne singly on short shoots below the males, 1.2-2.0 cm long, 2-5 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, 3-7 mm long; **fruiting catkins** erect to subpendulous, peduncled, cylindric, densely-arranged, cone-like, ascending, 1.0-2.5 cm long, 5-10 mm broad, becoming light brown and shattering with the fruits in fall or early winter; **scales** coriaceous to somewhat woody, 3 lobed, 3.0-4.5 mm long, 3-5 mm broad at the apex, pubescent, the lobes divergent at about the middle, borne nearly horizontally, the central lobe wedge-shaped, acute, much shorter than the basal and lateral lobes, lateral lobes broad, irregularly angular; **peduncle** 4-10 mm long, 1.0-1.5 mm broad; **male flowers: florets** reduced, subsessile, usually 3 per inflorescence scale; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally at anthesis; **filaments** very short, basally adnate to the tepals; **perianth** of (1) 2 (4) minute, greenish tepals, rounded, usually bearing several conspicuous glands at the summit; **male inflorescence** a slender, pendulous, cylindric, short-peduncled, densely-bracteate catkin, (5) 6-9 (11) cm long at anthesis, 5-12 mm broad; (the primary bracts) broadly ovate, acute; borne singly (rarely in pairs) at the ends of branchlets (not on short shoots), formed the season before blooming and exposed during the winter; **peduncle** glabrous, 5-10 mm long, 0.8-1.2 mm broad; **leaves** alternate, subdistichous, usually borne

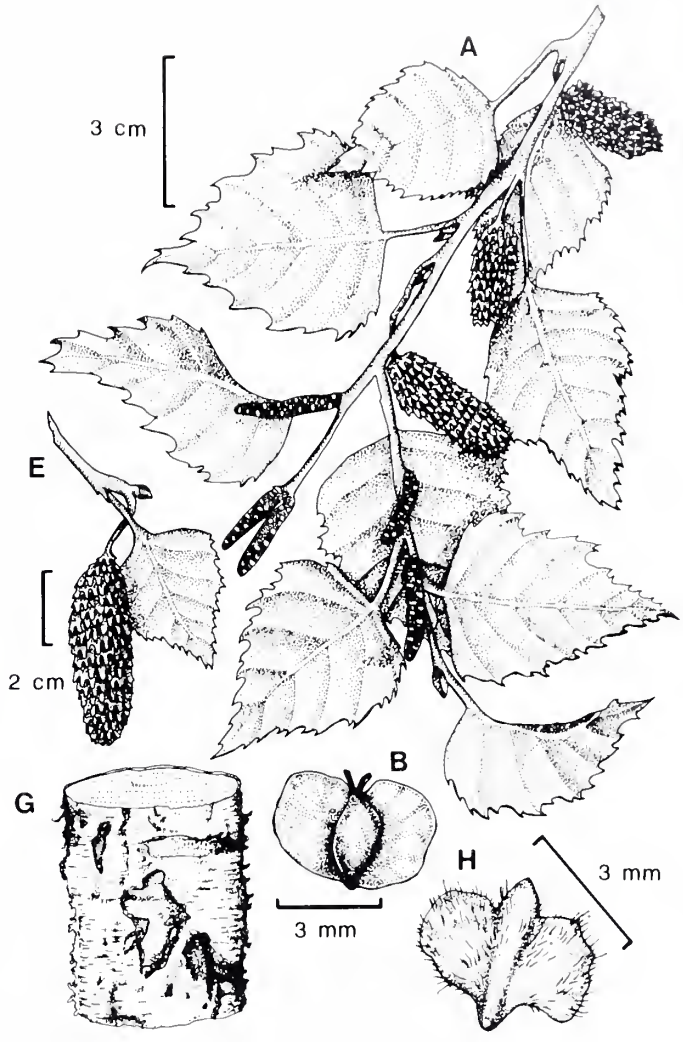
on short shoots, the blades thin, broadly ovate to deltoid or rhombic, 3-10 cm long, 3-8 cm broad, coarsely, irregularly or sometimes obscurely doubly serrate, the apex abruptly long-acuminate, the base truncate to cuneate, the upper surface glabrous, the lower surface glabrous or sparsely pubescent to tomentose, especially along major veins and in vein axils, often dotted with minute, resinous glands; **petioles** short, terete, 1.8-2.5 cm long, glabrous; **fall color** yellow; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, appressed, 5-10 mm long, 2-5 mm broad, apex acuminate, **bud scales** numerous, imbricate, ovate, acuminate, smooth, brownish red, generally only the outer 3 visible before shedding; **stipules** broadly ovate, obtuse, 2-8 mm long, 3-4 mm broad, greenish to light brown; **branches** subdistichous, usually composed of obvious long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, often dotted with very small, resinous glands, dark brown with pale elliptical lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval, with 3 nearly evenly-spaced elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, relatively thin, tight, when young dark reddish brown with pale horizontally expanded lenticels, when mature grayish to chalky white (but not exfoliating), **lenticels** dark, greatly expanded horizontally; **trunks** usually several, often somewhat crooked or leaning, up to 10 cm in diameter (maximum about 15 cm), often sprouting from the base; **crown** broadly pyramidal, the branching usually excurrent, becoming deliquescent in age, branches pendulous at the ends, small trees up to 10 m; **root system** shallow, spreading (2n = 28).

Variation and Hybridization: *Betula populifolia* crosses with a number of other birches where it comes in contact with them, including *B. alleghaniensis*, *B. papyrifera*, and *B. pumila*; the offspring are recognizable by their intermediate leaf, bark, and other characteristics. *Betula populifolia* also crosses with *B. cordifolia* to produce the blue birches, *B.* × *caerulea* Blanch. Big blue birch, at one time treated as a species, *B. caerulea-grandis* Blanch, resembles *B. papyrifera* in size, bark morphology, and general aspect, but its leaves are glabrous with more extended apices and more rounded or strongly cuneate bases, and its cone scales, like those of *B. populifolia*, have a short central lobe. More typical *B.* × *caerulea* is similar in habit but of smaller stature, reaching only 8 or 9 m, and it has somewhat smaller and more sharply cuneate leaves. Sargent (1922) first suggested that both of these forms are hybrids of *B. papyrifera* and *B. populifolia*, while Fernald (1922, 1950) concluded that *B. caerulea-grandis* was a "good" species, and that *B. caerulea* represented a hybrid between it and *B. populifolia*. Recent studies of populations of these birches by a number of workers have shown that plants called both *B. caerulea* and *B. caerulea-grandis* actually represent hybrids between *B. populifolia* and *B. cordifolia*, and that local individuals of *B. papyrifera* apparently do not enter into the hybridization (see Grant & Thompson, 1975; DeHond & Campbell, 1989).

Importance: The gray birch is an important successional tree on disturbed land, especially where rocky or other infertile soils prevail. This species is one of the first trees to revegetate burned or cut-over areas, and it covers large expanses of such land in the Northeast. It is common in Pennsylvania on lands that have been strip-mined. Like *B. papyrifera*, it stabilizes the soil and provides cover and winter browse for deer and other herbivores. Birds and other small animals feed extensively on the tiny fruits. The wood is used for firewood and pulp for paper, but it is rather light and weak, and has little other commercial value.

Note: Gray birch is primarily a tree of the northern Atlantic seaboard and the St. Lawrence-lower Great Lakes region. In New York it is common throughout the eastern and central parts of the State, as well as the southern Adirondack region, mostly at low elevations. It is one our most distinctive trees, with its non-peeling, grayish-white bark and large, black inverted V-shaped marks below branches and branch scars. Its leaves are unique among our birches in their nearly deltoid shape and long, extended tips. Unlike *B. papyrifera*, the trunks of gray birch usually form small clumps. Its fruits have very wide, membranaceous wings in relation to their body width, and the fruiting catkins scales are unique in their extremely short central lobe.





8. *Betula pendula* Roth

Common Names: Weeping Birch, White Birch, European White Birch, Silver Birch

Type Description: Roth, Tent. Fl. Germ. 1: 405, 1788

Synonym: *B. verrucosa* Ehrh.

Origin: Europe

Habitats: Waste places and open woods, especially in rocky or light sandy soils

Habit: A medium-sized tree, often with several trunks, forming a spreading clump

Flowering: April-May

Fruiting: August-October

General Distribution: In eastern North America, sometimes persisting after cultivation and occasionally locally adventive; native to most of Europe, from the subarctic south to Spain, Italy, and the Balkan Peninsula

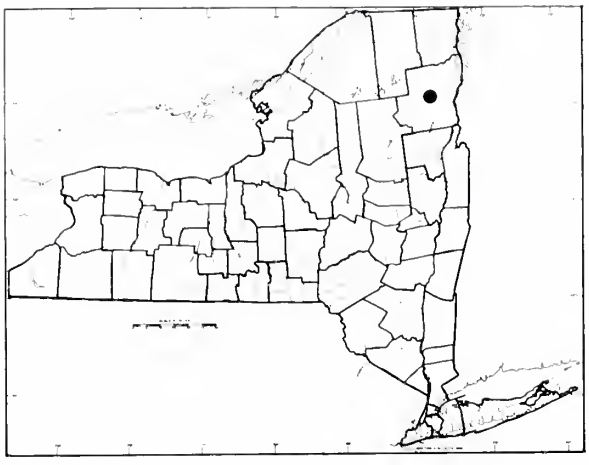
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, bright red when receptive, 0.6-2.0 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.7 mm long, nude; **fruit** 2.0-3.2 mm long, 7.5-11.0 mm broad, the body ellipsoid to obellipsoid, 1.5-2.2 mm broad, light brown, the wings much wider than the body, widest near the center, extending beyond the body apically, 3.0-4.5 mm broad; only 1 **seed** developing, this straight, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, these partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect, peduncled, cylindric, bracteate catkins, borne singly on short shoots below the males, 2.0-4.0 cm long, 8-10 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, 3-6 mm long; **fruiting catkins** erect to subpendulous, peduncled, cylindric, densely-arranged, cone-like, ascending, 2.0-3.5 cm long, 6-10 mm broad, becoming light brown and shattering with the fruits in fall or early winter; **scales** coriaceous to somewhat woody, 3 lobed, 3.0-4.0 mm long, 3-5 mm broad at the apex, pubescent, the lobes divergent at about the middle, held nearly horizontally to slightly recurved apically, the central lobe wedge-shaped, obtuse, usually much shorter than the basal and lateral lobes, lateral lobes broad, rounded to irregularly angular; **peduncle** 1.5-2.0 cm long; **male flowers: florets** reduced, subsessile, usually 3 per inflorescence scale; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided into 2 half-anthers consisting of a single theca, dehiscing longitudinally at anthesis; **filaments** very short, basally adnate to the tepals; **perianth** of (1) 2 (4) minute, greenish tepals, rounded, usually bearing several conspicuous glands at the summit; **male inflorescence** a slender, pendulous, cylindric, short-peduncled, densely-bracteate catkin, 4.0-10.0 cm long at anthesis, 7-10 mm broad, (the primary bracts) broadly ovate, acute; borne at the ends of branchlets (not on short shoots), formed the season before blooming and exposed during the winter; **peduncle** glabrous, 3-6 mm long, 0.8-1.2 mm broad; **leaves** alternate, subdistichous, usually borne on short shoots, the blades thin, broadly ovate to rhombic, 3-7 cm long, 2.5-4.0 (5) cm broad, coarsely and

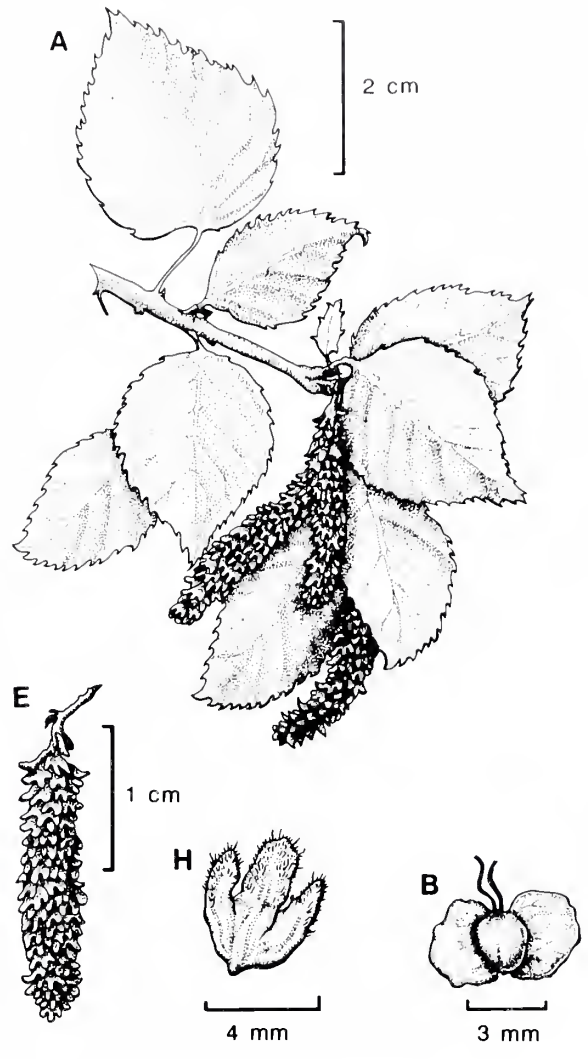
sharply doubly serrate, the apex acuminate, the base cuneate (or rarely truncate), the upper surface glabrous, the lower surface glabrous or sparsely pubescent only along major veins and in vein axils, often dotted with, resinous glands; **petioles** short, terete, 2-3 cm long, glabrous; **fall color** yellow; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, appressed, 4-10 mm long, 2-5 mm broad, apex acuminate, **bud scales** numerous, imbricate, ovate, acuminate, smooth, brownish red, generally only the outer 3 visible before shedding; **stipules** broadly ovate, obtuse, 2-7 mm long, 2-3 mm broad, greenish to light brown; **branches** subdistichous, usually composed of obvious long and short shoots, often pendulous; young **twigs** thin, terete, pendulous, glabrous, dotted with resinous glands, dark brown with pale elliptical lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval, with 3 nearly evenly-spaced elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, relatively thin, exfoliating in shreds, when young dark reddish brown with pale horizontally expanded lenticels, in maturity creamy to silvery white, in age becoming fissured and black, **lenticels** dark, greatly expanded horizontally; **trunks** usually several, often crooked or leaning, up to 20 cm in diameter; **crown** broadly rounded, the branching usually excurrent, becoming deliquescent in age, branches pendulous, medium-sized trees up to 20 (30) m; **root system** shallow, spreading (2n = 28).

Variation and Hybridization: *Betula pendula* is an extremely variable species in Europe, especially in leaf shape and margin. However it can easily be distinguished from the other white-barked birches occurring in our range by the combination of its peeling bark and glabrous leaves with acuminate tips. In Europe, *B. pendula* widely hybridizes with *B. pubescens* Ehrh. (*B. alba* L.) in spite of experimentally demonstrated extrachromosomal sterility barriers. It can be artificially crossed with *B. papyrifera*, although no introgression into populations of the latter has been noted.

Importance: The weeping birch is an important landscaping tree throughout the eastern United States, as well as other temperate regions of the world. Although it is short lived and especially susceptible to attack by the bronze birch borer, it is the most widely planted white-barked birch in our area. A number of cultivars exist, including cut-leaved, purple-leaved, and extreme weeping forms. In northern Europe, the bark and wood of this species are distilled to yield an oil used to prepare leather and in the manufacture of various lotions, ointments and medicines.

Note: *Betula pendula* is closely related to the gray birch, *B. populifolia*, which it sometimes resembles on the basis of leaf, fruit, cone scale, and other characteristics. However, in *B. pendula*, the acuminate leaf apex is usually much less extended than it is in *B. populifolia*, and the leaf base is nearly always cuneate in the former and truncate in the latter. The best distinguishing character is the bark, which freely peels in *B. pendula* but not in *B. populifolia*.





9. *Betula minor* (Tuckerman) Fern.

Common Name: Dwarf White Birch

Type Description: Tuckerman, Amer. Jour. Sci. 45: 31, 1843

Synonyms: *Betula papyracea* var. *minor* Tuckerman, *B. alba* var. *minor* (Tuckerman) Fern., *B. pubescens* ssp. *odorata* (Bechst.) Löve & Löve

Origin: Northeastern North America; possibly derived through hybridization of *Betula cordifolia* and *B. glandulosa*

Habitats: In New York: found only on rocky alpine summits, including Mount Marcy, Mount McIntyre, Mount Haystack and Indian Pass; elsewhere on rocky barrens and slopes

Habit: An upright to somewhat depressed, small tree or coarse shrub

Flowering: June-July

Fruiting: August-September

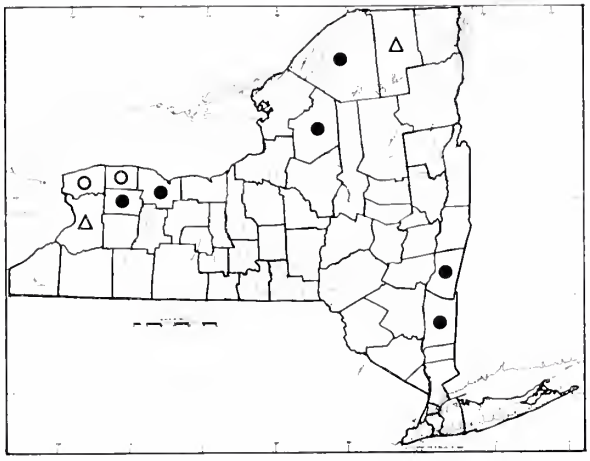
General Distribution: Labrador south to Newfoundland, the Gaspé Peninsula and Laurentide Mountains, Quebec and mountain summits and passes of northern New England and northeastern New York

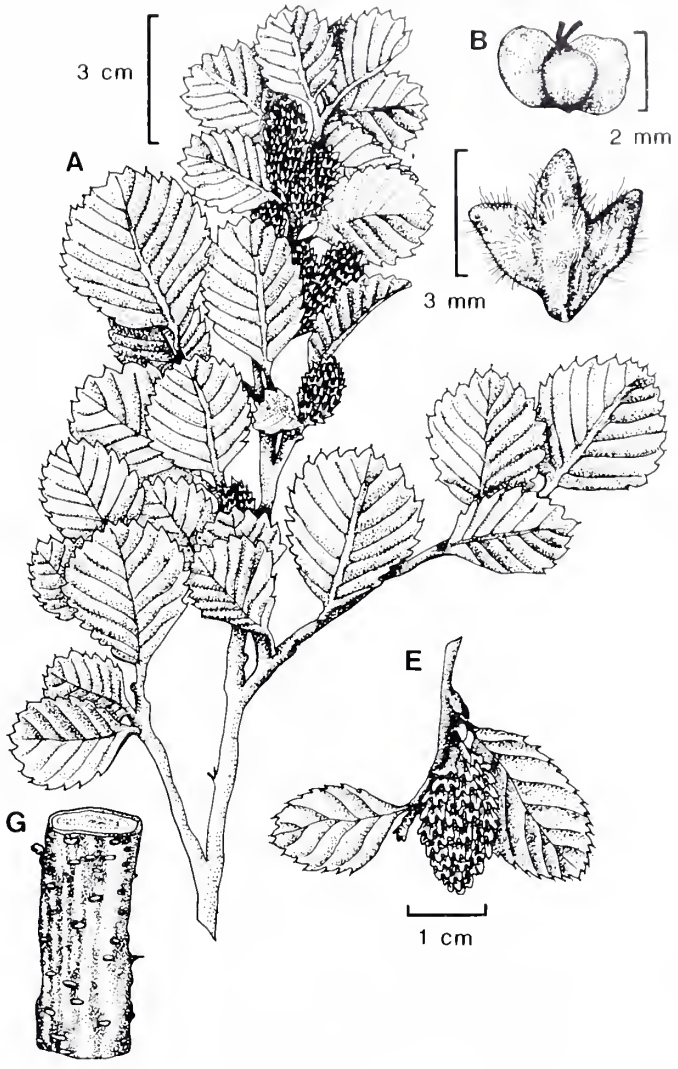
Rarity Status: This species has a New York State legal status of E (endangered). The New York Natural Heritage Program gives it a global rank of G5 (globally secure) and a State rank of S1 (five or fewer occurrences)

Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.5-1.8 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, nude; **fruit** 1.8-3.0 mm long, 2.5-4.5 mm broad, the body ellipsoid, 0.8-1.5 mm broad, light brown, the wings, broader than the body, broadest near the summit, extending beyond the body apically, 0.8-1.8 mm broad; 1 straight **seed** developing, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect subsessile cylindric densely-arranged bracteate catkins, borne singly on short shoots below the male, 1.0-2.5 mm long, ca. 2 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, 1-2 mm long; **fruiting catkins** erect, short-peduncled, cylindric, dense, cone-like, 1.8-2.4 cm long, 4-10 mm broad, becoming light brown and shattering with the fruits in fall or early winter; **scales** coriaceous to somewhat woody, 3 lobed, pubescent or glabrous, 4-6 mm long, 3.0-4.5 mm broad at the apex, the lobes diverging at about the middle, upturned, the central lobe elongate with an obtuse tip, somewhat longer than the base, the lateral lobes shorter and broader than the central one; **peduncle** 1.5-4.0 mm long; **male flowers: florets** reduced, subsessile, usually 3 per inflorescence scale; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally; **filaments** very short, basally adnate to the tepals; **perianth** of 2 minute, light brownish tepals, rounded, usually bearing several conspic-

uous glands at the apex; **male inflorescences** slender, pendulous, subsessile, cylindric, densely-arranged bracteate catkins, 5.5-9.0 cm long, 5-11 mm broad at anthesis, borne singly or paired at branchlet tips (not on short shoots), formed the season before blooming and exposed during winter, composed of 3-flowered cymules subtended by 3 partially fused bracts; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 3.5-7.1 mm long, ca. 1.5 mm broad; **leaves** alternate, subdistichous, borne on short shoots, usually 2 leaves per shoot, blades firm, ovate, (1.5) 2.0-3.7 (4.5) cm long, (1) 1.4-2.8 (3.2) cm broad, coarsely and irregularly doubly serrate, apex acute to rounded, the base rounded or cuneate, upper surface glabrous, the lower glabrous or sparsely pubescent, moderately pubescent to tomentose along the major veins and in vein axils, often with minute, scattered, resinous glands; **petioles** terete, 0.8-1.2 cm long, glabrous; **fall color** yellow; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, appressed, 4-5 mm long, 2-3 mm broad, the apex acute, **bud scales** numerous, imbricate, ovate, acuminate, smooth, brownish red, only the outer 3 visible before shedding; **stipules** obovate, obtuse or rounded, 3-5 mm long, 1-2 mm broad, greenish to light brown; **branches** subdistichous, composed of pronounced long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, variously warty with large resinous glands, dark reddish brown, scattered with prominent, pale, elliptic lenticels; **leaf scars** raised, crescent-shaped to suboval with 3 nearly evenly-spaced, circular, vascular bundle scars; **pith** pale, continuous, circular to obscurely triangular; **bark** smooth, thin, tight, dark reddish brown with pale, horizontally expanded **lenticels**; **trunks** 1 to several, to about 10 cm in diameter; **crown** irregularly spreading, rounded, a low irregular shrub, the branches depressed or ascending, deliquescent, up to 2 (3) m tall; **root system** shallow (2n = 56).

Note: The origin of this dwarf, alpine birch is not certain. Originally described by Tuckerman from the White Mountains of New Hampshire as a variety of *Betula papyracea* Ait. (*B. papyrifera* Marsh.), it has usually been treated as a separate species since the publication of the eighth edition of Gray's Manual (Fernald, 1950). Fernald, however, states that it "simulates *B. odorata* var. *tortuosa* of arctic Eurasia and Greenland," and Löve and Löve (1966) have transferred it to *B. pubescens* ssp. *odorata* (Bechst.) Löve & Löve. Scoggan, in his recent *Flora of Canada*, considers *B. minor* to represent an eastern extension of western North American *B. occidentalis* Hook. In New York, New England and southern Quebec, this species occurs in the same communities as *B. cordifolia* and *B. glandulosa*, and it has widely been presumed that it represents a hybrid between these species. This theory is complicated by the fact that *B. glandulosa* is known so far only as a diploid (2n = 28) while *B. cordifolia* may be either (rarely) a diploid or (most commonly) a tetraploid (2n = 56). *Betula minor* from Mt. Washington was found (by Löve and Löve, 1966) to be tetraploid. If *B. minor* is, in fact, of hybrid origin, it may represent an allopolyploid derivative, with either *B. cordifolia* or *B. papyrifera* as the tetraploid parent species. The leaves of *B. minor* are smaller and have fewer lateral veins than those of *B. cordifolia*, but their margins are similar, with the teeth just as large and sharp. The bark remains relatively tight and dark, even in the mature trees.





10. *Betula pumila* L.

Common Names: Bog Birch, Dwarf Birch, Low Birch, Swamp Birch

Type Description: Linnaeus, Mant., p. 124, 1767

Synonyms: *Betula humilis* Marsh., *B. alpestris* Fries, *B. pumila* var. *glandulifera* Regel, *B. pumila* var. *glabra* Regel, *B. glandulifera* (Regel) Butler, *B. glandulosa* var. *glandulifera* (Regel) Gleason, *B. hallii* T. J. Howell, *B. glandulosa* var. *hallii* (T. J. Howell) C.L. Hitche., *B. nana* var. *glandulifera* (Regel) Boivin

Origin: Northwestern North America

Habitats: Bogs, calcareous fens and wooded swamps

Habit: A small to large shrub with a spreading rounded crown, sometimes heterophyllous, with large-leaved sprouts from the base

Flowering: May-June

Fruiting: September-October

General Distribution: Newfoundland to British Columbia, south to central Montana, northern Indiana, Iowa and eastern New York

Rarity Status: This species has a New York State legal status of R (rare). The New York Natural Heritage Program gives it a rank of G5 (secure globally) and a State rank of S2 (6-20 occurrences)

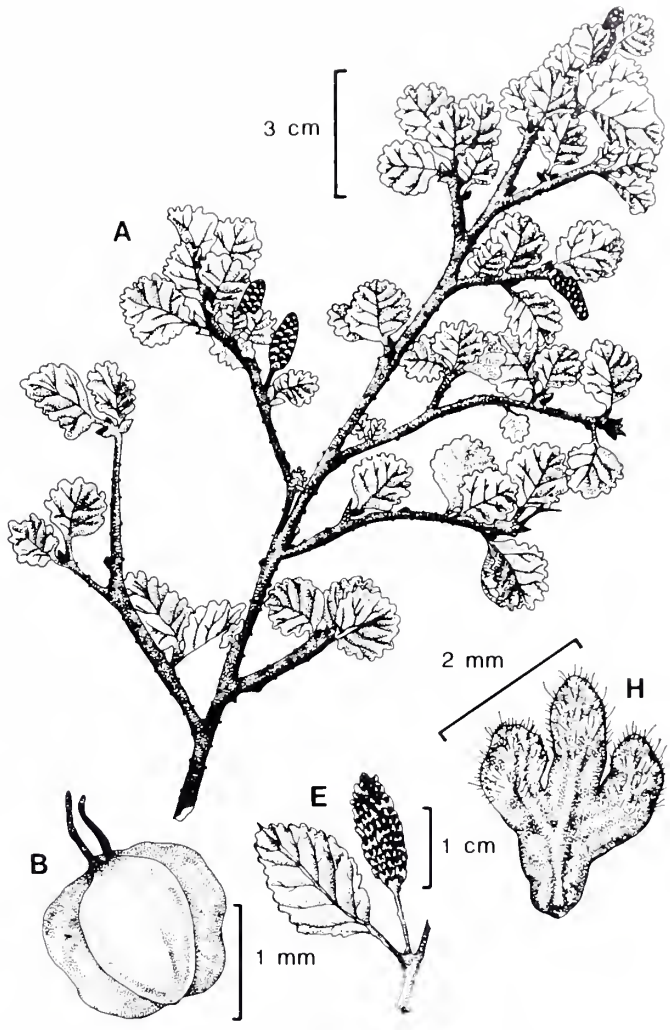
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, red when receptive, 0.5-1.3 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, nude; **fruit** 1.6-2.5 mm long, 2.5-3.2 mm broad, the body ellipsoid to obovoid, 1.0-1.5 mm broad, light brown, the wings slightly narrower than the body, widest near the center, not extending beyond the apex, 0.7-1.0 mm broad; 1 straight **seed** developing, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect, subsessile, cylindric, densely-arranged, bracteate catkins, borne singly on short shoots below the male, 1.5-2.0 cm long, 1-2 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle**, 0.4-1.2 cm long; **fruiting catkins** ereet, subsessile, short-cylindric, dense and cone-like, 0.8-3.0 cm long, 0.5-1.2 cm broad, becoming dark brown and shattering with the fruit in fall or early winter; **scales** coriaceous to woody, 3-lobed, 3.0-4.5 mm long, 3.5-5.0 mm broad, the lobes diverging at about the middle, spreading at right angles to the axis, the central lobe narrow with a rounded tip, longer than the limb, the lateral lobes shorter and broader than the central one; **peduncle** 1-2 mm long; **male flowers: florets** reduced, subsessile, usually 3 per scale in the inflorescence; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally; **filaments** short, basally adnate to the tepals; **perianth** of 2 minute, greenish tepals, their rounded tips usually bearing several conspicu-

ous glands; **male inflorescences** slender, pendulous, subsessile, cylindric, densely bracteate catkins, 5-7 cm long, 5-10 mm broad at anthesis, composed of 3-flowered cymules subtended by 3 partially fused bracts, usually borne singly near the tips of branchlets (not on short shoots), formed with the new growth in spring; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 2-5 mm long, **leaves** alternate, subdistichous, borne on short shoots, blades thin, obovate to orbicular (occasionally reniform), (2) 3-4 (6) cm long, 0.5-3.0 (5) cm broad, dentate or dentate-serrate, the apex rounded, the base usually cuneate, the upper surface glabrous, moderately glandular, the lower surface sparsely to moderately pubescent to tomentose along the major veins and in vein axils, covered with small resinous glands; **petioles** short, terete, 0.8-1.5 cm long, glabrous to moderately pubescent, moderately glandular; **fall color** greenish to yellowish brown; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, terete, 5-6.5 mm long, 3.5-4.5 mm broad, the apex acute to acuminate, the **bud scales** numerous, imbricate, ovate, acuminate, smooth, brownish red, only the outer 3 visible before shedding; **stipules** broadly elliptic, obtuse, 5-8 mm long, 3-5 mm broad, ciliate, greenish or light brown; **branches** subdistichous, usually with obvious long and short shoots; young **twigs** terete, glabrous to moderately pubescent with scattered resinous glands, dark brown, with prominent pale elliptical lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval with 3 evenly-spaced elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, relatively thin, tight, dark reddish brown, with inconspicuous brownish **lenticels**; **trunks** several, straight to crooked and leaning, to about 65 cm in diameter; **crown** irregular to rounded, a large, spreading shrub with branches erect to prostrate in severe climates, deliquescent, usually dwarfed, rarely up to 3 m tall; **root system** shallow (2n = 56).

Variation and Hybridization: *Betula pumila* is a variable species whose leaves range in size from rather small to quite large, even on the same plant (sometimes apparently in response to flooding of the substrate), and in pubescence, from almost entirely glabrous to densely tomentose below. Two varieties have been recognized by Fernald and others. Variety *glandulifera* Regel, with conspicuous, resinous glands on the lower leaf surfaces (the form found in our area) occurs throughout boreal Canada from Labrador to Alaska, reaching as far south as the James Bay region of Ontario and the Adirondacks in the East. The typical variety, which lacks prominent leaf glands, ranges to the south and as far west as northern Illinois and Iowa. *Betula pumila* hybridizes with most of our other birches, including *B. alleghaniensis* (forming *B.* × *jackii* Schneid.), *B. lenta* (forming *B.* × *purpusii* Schneid.) and *B. papyrifera* (forming *B.* × *sandbergii* Britt.). The hybrid plants, in each case, have characteristics, including leaf shape and size, intermediate between those of the putative parents.

Importance: *Betula pumila* is of little direct use to man; however, it is an important and sometimes dominant component of the plant communities in which it occurs. Its fruits provide food for birds and small mammals, and bushy thickets of the shrub provide cover for these and other wildlife.

Note: *Betula pumila* is mostly restricted to bogs and calcareous fens. Along with *B. glandulosa*, it is distinguished from the other birches by its small, single-toothed, often rather rounded leaves. It is usually easily separated from *B. glandulosa* by its larger leaves, the lack of large, warty glands on the twigs, and its distinctive habitat. Gleason (1952) and Gleason & Cronquist (1963) treated *B. pumila* var. *glandulifera* as a part of *Betula glandulosa* rather than *B. pumila*, and Dugle (1966) treated it as a separate species, *B. glandulifera* Dugle. When the entire complex is taken into consideration, however, the two varieties of *B. pumila* are virtually indistinguishable in most characters, the presence of conspicuous glands on the leaves being the only tangible difference, and one which holds up only weakly. *Betula pumila* differs more significantly from *B. glandulosa*, both cytologically and morphologically (see Furlow, 1983), supporting their treatment as separate species.



11. *Betula glandulosa* Michx.

Common Names: Dwarf Birch, Tundra Dwarf Birch

Type Description: Michaux, Fl. Bor. Amer. II, p. 180, 1803

Synonym: *Betula littelliana* Tuckerman

Origin: Northern North America

Habitats: Arctic America to the south on acidic rocky barrens; in New York, only on crests and summits

Habit: An upright to depressed and distorted, spreading shrub

Flowering: June-August

Fruiting: August-September

Rarity Status: This species has a New York State legal status of E (endangered). The New York Heritage Program gives it a global rank of G4G5 (apparently secure, but rare in the periphery of its range) and a State rank of S1 (five or fewer occurrences)

General Distribution: Throughout the North American transcontinental subarctic zone, Newfoundland, Quebec and northern New Brunswick west to Alaska south to northern Washington, Colorado and mountainous Manitoba, alpine Maine, New York and New Hampshire

Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, (2) 3 per inflorescence scale, sometimes with 1 or more staminodes; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.5-1.5 mm long; **ovary** 1 per floret, cylindric, 2-locular at base, 1-locular above, ca. 0.5 mm long, nude; **fruit** 1.2-1.8 mm long, 2.2-3.0 mm broad, the body ellipsoid, 1.0-1.5 mm broad, light brown, the wings, narrower than the body, widest near the apex, extending somewhat beyond the apex 0.5-0.8 mm broad; 1 straight **seed** developing, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** absent; **female inflorescences** erect, subsessile, cylindric, bracteate catkins, borne singly on short shoots below the males, 0.5-1.8 mm long, 0.5-1 mm broad at anthesis; **scales** minute, 3-lobed; **peduncle** ca. 0.5 mm long; **fruiting catkins** erect, subsessile, cylindric, dense, cone-like, 1.0-2.5 cm long, 0.5-1.2 cm broad, becoming light brown and shattering with the fruits in fall or early winter; **scales** coriaceous to somewhat woody, 3 lobed, 2.3-3.0 mm long, 2-3 mm broad, the lobes divergent above the middle, rounded or truncate, upturned, the central lobe elongate, longer than the base, lateral lobes shorter and broader than the central lobe; **peduncle** 0.5-1.5 mm long, ca. 1.5 mm in diameter; **male flowers: florets** reduced, subsessile, usually 3 per scale in the inflorescence; **stamens** 2 per floret, opposite the tepals; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally; **filaments** very short, basally adnate to the tepals; **perianth** of 2 minute, greenish tepals, rounded, usually bearing several conspicuous glands at the summit; **male inflorescences** slender, pendulous, subsessile, cylindric, densely-arranged, bracteate catkins, 4-7 cm long, 5-10 mm broad at anthesis, com-

posed of 3-flowered cymules subtended by 3 partially fused bracts, usually borne singly near branchlet tips (not on short shoots), formed with the new growth in the spring; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 1-2 mm long, ca. 1.5 mm broad; **leaves** alternate, subdistichous, borne on short shoots, blades coriaceous, green on both sides, obovate to suborbicular, (0.5) 1-2 (3) cm long, 0.5-1.5 (2.5) cm broad, dentate, apex rounded, the base cuneate, upper surface mostly glabrous, the lower glabrous to sparsely pubescent, moderately pubescent along the major veins and in vein axils, with minute, scattered, resinous glands; **petioles** short, terete, 0.8-1.2 cm long, glabrous, moderately glandular; **fall color** greenish brown; **terminal bud** absent; **lateral buds** sessile, ovoid, terete, 5-6 mm long, 3-4 mm broad, the apex acute, **bud scales** several, imbricate, ovate, acute, smooth, reddish brown; **stipules** obovate, obtuse, 4-8 mm long, 3.0-4.5 mm broad, greenish to light brown; **branches** diffuse, with obvious long and short shoots; young **twigs** terete, glabrous to sparsely pubescent, conspicuously warty with relatively large resinous glands (more so to the west), medium to dark reddish brown, scattered with inconspicuous brownish, elliptic lenticels; **leaf scars** moderately raised, crescent-shaped to suboval, with 3 nearly evenly-spaced elliptical to circular vascular bundle scars; **pith** pale, continuous, obscurely triangular; **bark** smooth, thin, tight, medium brown, with more or less inconspicuous, barely expanded **lenticels**; **trunks** several, to about 5 cm in diameter; **crown** irregular to rounded, a spreading or ascending shrub, often depressed and matted in severe habitats, the branching deliquescent, rarely up to 2 (3) m tall; **root system** shallow, spreading (2n = 28).

Variation and Hybridization: Plants of *Betula glandulosa* in the northern and western parts of its range typically have very densely glandular twigs, but those occurring in New York and on the mountains of New England demonstrate relatively few and more scattered glands on the young growth. In moderate environments, the leaves become about 3 cm long and have an elliptic outline, obtuse apex and wedge-shaped base. But in more severe habitats, they are smaller (0.5 to 1.5 cm long) and, at the extreme, quite rounded. *Betula glandulosa* is closely related to the circumpolar, arctic *B. nana* L., which is present in the Maritime Provinces as a race that has been given the name *B. michauxii* Spach. *Betula nana* is a shrub with even smaller leaves and further reduced florets, cone scales and fruits. Betula *glandulosa* hybridizes with *B. pumila*, producing plants known as *B.* × *sargentii* Dugle (*B. raymundii* Lepage). However, this hybridization apparently does not occur in our area due to the widely separated habitats of these species. Betula *glandulosa*, *B. cordifolia* and *B. papyrifera* are possible parents of *B. minor*, should that species be of hybrid origin (See *B. minor* for a fuller discussion.)

Importance: In New York, *B. glandulosa* is a rare plant of little economic or ecological importance. In the subarctic, this species is a major component of the vegetation of vast areas of the tundra region where it is browsed by cervine mammals.

Note: In New York and New England, this species occurs only on open alpine summits, where it forms depressed thickets of twisted branches. In the West, where its range extends southward in the Rocky Mountains, it consists of much bushier, more upright shrubs. One of its most characteristic features is the large yellowish or orangish to brown, resinous glands covering the young twigs, giving them a distinctive, warty appearance. Other birches found in New York (*e.g. B. pendula*) sometimes have glandular stems, but in these species the glands are small and relatively inconspicuous by comparison.

3. CARPINUS

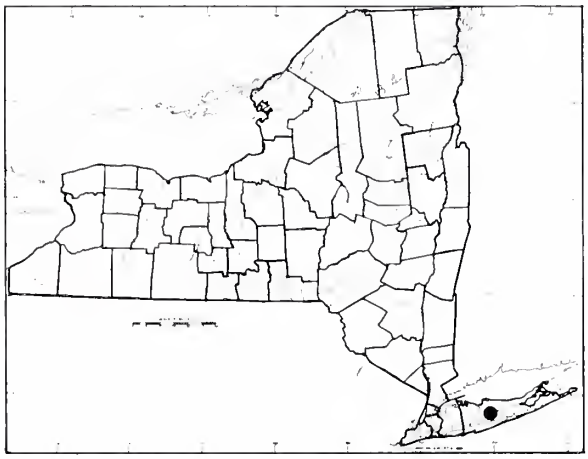
Common Names: Hornbeam, Ironwood, Musclewood
Authority: Linnaeus, Species Pl. II, p. 998, 1753
A primarily Asian genus of about 25 species of small trees. Hornbeams are found mostly in the Northern Temperate Zone, but they also range southward into the cool, montane forests of Central America. They occur mostly in moist, cool habitats, often along shaded stream banks and on damp, forested slopes. Our single native species, *Carpinus caroliniana* Walt., is shade-tolerant and often forms a more or less permanent subcanopy in deciduous forests. The wood of *Carpinus* is extremely hard and heavy, and the group has little commercial value. *Carpinus betulus* is a small tree cultivated as a landscape plant in a number of horticultural forms.

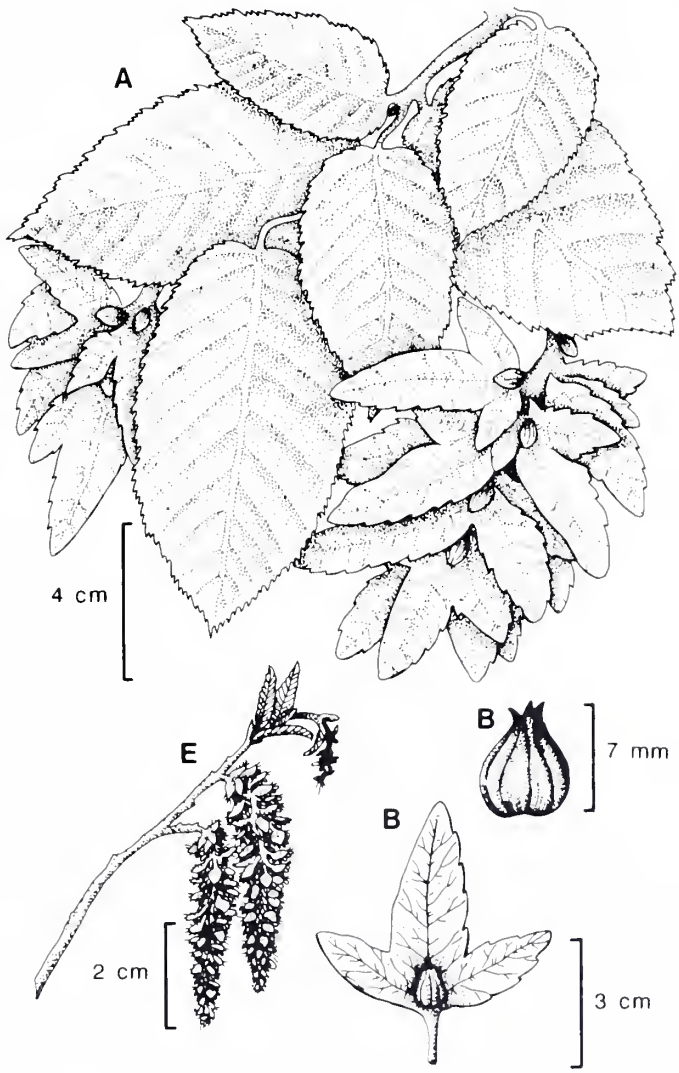
Description: Plants monoecious: **female florets: stigma** 1 per style; **styles** 2, narrowly cylindric, persistent in fruit; **ovary** 1 per floret, cylindric, inferior; **ovules** 2, only 1 usually developing; **fruit** a tiny, ovoid-deltoid, dark brown, hard-shelled nutlet, dorsoventrally compressed, crowned by the persistent styles; **seed** 1, closely invested and filling the fruit; **embryo** large, straight, with flat cotyledons; **endosperm** thin, nuclear; **perianth** of several reduced, scale-like tepals forming a membranaceous fringe at the summit of the ovary; **female inflorescences:** lax, pendulous, uncrowded catkins, borne singly at the tips of new growth shoots in spring; **scales** 3-lobed, consisting of 3 partially-united bracts, each subtending 2 florets and expanding to become foliaceous in fruit; **peduncle** short, flexuous; **male florets: stamens** 3 (6); **filaments** short, divided nearly to the base; **anthers** 2-chambered, divided longitudinally into 2 separate 1-chambered parts, each crowned by a tuft of long hairs; **perianth** absent; **male inflorescences:** pendulous, cylindric, uncrowded catkins borne singly and laterally, with numerous helically-arranged **scales** composed of 3 partially-united bracts and each bearing a cymule of 3 very crowded florets, formed the season before blooming, but concealed in bud through the winter; **peduncles:** short, stiff; **buds** sessile, ovoid, more or less square in cross section, scales many, imbricate with longitudinal striations; **leaves** simple, alternate, strongly 2-ranked, narrowly ovate, ovate, elliptic or obovate, doubly and usually irregularly ser-

rate with strong, parallel secondary veins diverging from a strong midrib; **petioles** usually short, rather stiff; **stipules** present, deciduous; **twigs** terete, reddish-brown to gray, slender, with circular pith in cross section; **bark** thin, smooth, tight, bluish to ash gray, dull with inconspicuous, circular **lenticels**; **trunk** usually crooked and leaning (but sometimes straight when open-grown), shallowly to deeply and irregularly fluted with an irregular, spreading **crown**; **root system** shallow, spreading.

KEY TO SPECIES OF CARPINUS

1. Central lobe of mature, fruiting, catkin bracts 3.5-5.0 cm long; winter buds 5-10 mm long (medium sized, usually strongly ascending, introduced trees rarely escaping or persisting after cultivation).....1. *C. betulus*
1. Central lobes of mature, fruiting, catkin bracts mostly 2.0-3.5 cm long; winter buds 3-4 mm long (small, spreading, native, understory trees of moist rich woods and streambeds).....2. *C. caroliniana* ssp. *virginiana*





1. *Carpinus betulus* L.

Common Names: European Hornbeam

Type Description: Linnaeus, Species Pl. II, p. 998, 1753

Origin: Europe

Habitats: Abandoned landscape plantings and park margins

Habit: Dependent on the cultivar: often a small, upright tree with a short trunk, many ascending limbs and a narrow, bushy crown

Flowering: March-April

Fruiting: September-October

General Distribution: Rarely escaping or persistent after cultivation in temperate North America; native in central and southeastern Europe south to Italy, southern France, southeastern England, southern Sweden and the western Soviet Union

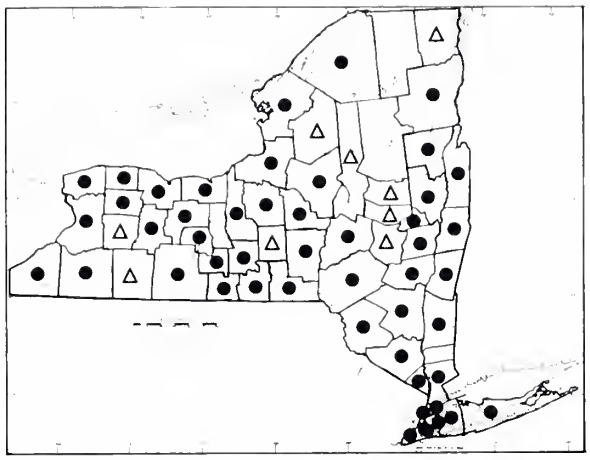
Description: Plants **monoecious**; **female flowers**: **florets** reduced, sessile, usually 3 per scale in the inflorescence; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.8-2.0 mm long, persistent in fruit; **ovary** 1 per floret, cylindric, 2-locular at base, 1-locular above, ca. 1 mm long, inferior; **fruit** 5-8 (10) mm long, 4-5 mm broad, dark brown at maturity; 1 straight **seed** developing, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** of several scale-like tepals adnate to the ovary and apparent as a membranaceous or short-fringed margin at its apex; **female inflorescence** a pendulous, subsessile, more or less irregular, lax, bracteate catkin, borne

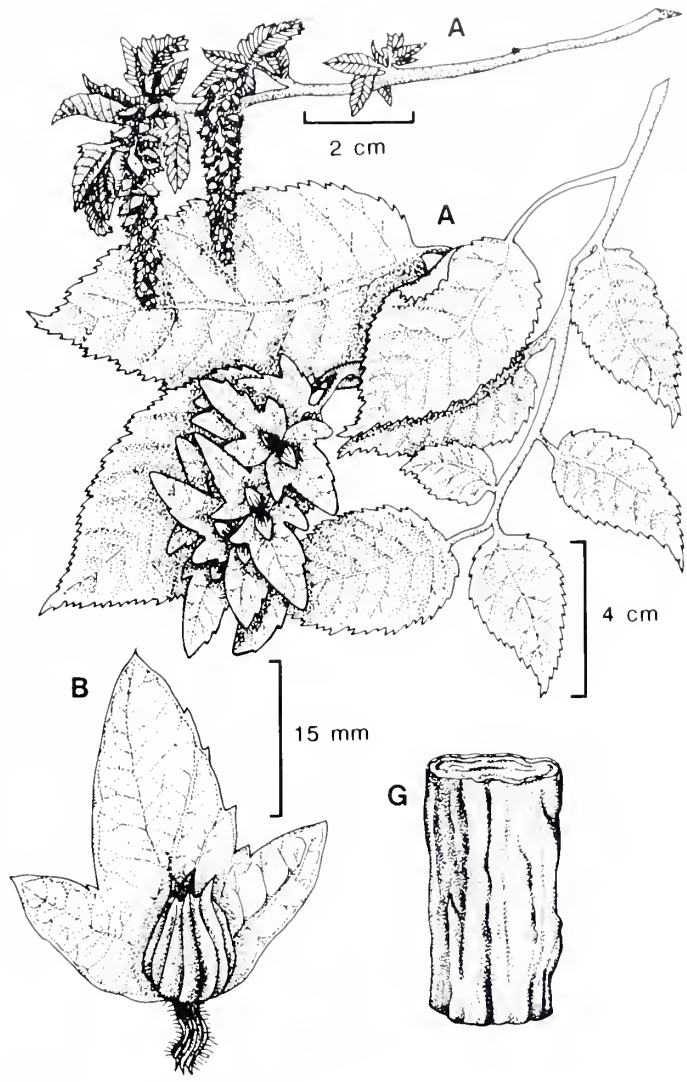
singly at the apex of new growth, 1-3 cm long, 4-6 mm broad at anthesis; **scales** 3-lobed; **peduncle**, 1-2 mm long; **fruiting catkins** pendulous, subsessile, irregularly strobiloid, 5-14 cm long, 4.5-6.5 cm broad, lax, consisting of racemose clusters of paired fruits, each pair subtended by an expanded, foliaceous scale; **scales** coriaceous, 3 lobed, asymmetrical, (2.5) 3.5-5.0 cm long, 2.0-3.2 cm broad (from tip to tip of the lateral lobes), the lobes divergent near the base, slightly ascending, the central lobe oblong, broader and much longer than the lateral, entire or with 1 to several course teeth along its outer margin, the apex obtuse, scales becoming light brown and scattering with the fruits attached in the fall; **peduncle** 1.0-2.2 cm long, 1.0-1.5 mm broad; **male flowers: florets** sessile, crowded, 3 per inflorescence scale (not readily apparent); **stamens** 3-4 (6) per floret; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, each crowned with a tuft of long hairs at the summit, dehiscing longitudinally; **filaments** 0.5-0.8 mm long, undivided or divided to about one fourth their length; **perianth** usually absent; **male inflorescence** a slender, pendulous, cylindric, relatively lax, bracteate catkin, 2-5 cm long, 4.5-6.0 mm broad, composed of 3-flowered cymules subtended by 3 fused bracts; borne singly from a lateral bud below the females, formed the season before blooming but concealed in bud during the winter; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 2-4 mm long, ca. 1.5 mm broad; **leaves** alternate, distichous, usually borne laterally on short shoots, the blades thin, broadly ovate to elliptic, (4) 8-10 (12) cm long, (2.5) 3.5-5.0 (6) cm broad, coarsely and unevenly doubly serrate, the apex acuminate to abruptly subcaudate, the base rounded to subcordate, upper surface glabrous, the lower also glabrous, but moderately pubescent along the major veins and in vein axils; **petioles** terete, (3.5) 5-15 (18) cm long, glabrous; **fall color** greenish to yellowish brown; **terminal bud** absent; **lateral buds** sessile, narrowly oblong, slender, more or less 4-angled in cross section, appressed to the twig, 5-10 mm long, 2.0-3.5 mm broad, the apex acute, the **bud scales** numerous, imbricate, smooth, pale brown; **stipules** broadly ovate, obtuse, 6-9 mm long, 2.5-4.1 mm broad, ciliate, greenish or light brown; **branches** distinctly distichous, composed of more or less poorly-defined long and short shoots, ascending; young **twigs** terete, glabrous to sparsely pubescent, dull brown, lacking conspicuous lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval, with 3 nearly evenly-spaced, elliptical to circular vascular bundle scars; **pith** pale, continuous, circular to obscurely triangular; **bark** smooth, thin, tight, ash gray, without conspicuous **lenticels**; **trunk** usually 1, shallowly and irregularly fluted, to 35 cm in diameter (maximum about 50 cm); **crown** relatively dense, narrowly-rounded, the branching deliquescent, up to 20 (30) m tall; **root system** shallow, spreading ($2n = 64$).

Variation and Hybridization: A number of cultivars of this species are commonly grown in the United States, especially ones having short trunks, bushy growth, and fastigiate branching (see Krussmann, 1984). Thus, our cultivated trees seldom closely resemble the wild species. This species is not known to hybridize with native *C. caroliniana*.

Importance: The European hornbeam is an important forest tree throughout much of central and southern Europe, where it forms a dominant component of the vegetation. There it is used as a source of wood for making furniture and turned objects. In the United States it may occasionally persist after cultivation, but it usually does not become established.

Note: *Carpinus betulus* closely resembles *C. caroliniana* vegetatively. The two species are most easily distinguished by the lengths of the fully developed winter buds and the bracts of their fruiting catkins.





2. *Carpinus caroliniana* Walt.
ssp. *virginiana* (Marsh.) Furlow

Common Names: American Hornbeam, Blue Beech, Musclewood, Ironwood, Charme (Quebec)

Type Description: Walter, Fl. Carol., p. 236, 1788

Synonyms: *Carpinus betulus virginiana* Marsh., *C. virginiana* (Marsh.) Sudworth, *C. caroliniana* Walt. var. *virginiana* (Marsh.) Fern.

Origin: Eastern North America

Habitats: Stream banks, floodplains and adjacent slopes in the understories of moist, deciduous forests

Habit: A small, spreading tree with an open irregular crown, the trunk often crooked, leaning and with muscle-like fluting

Flowering: April-May

Fruiting: September-November

General Distribution: Southern Quebec west to northeastern Minnesota, central Iowa, central Missouri and northeastern Oklahoma, south to New Jersey on the Atlantic Coastal Plain and in the Piedmont and Appalachian Mountains to northern Georgia. It is replaced on the coastal plain from New Jersey southward by ssp. *caroliniana*

Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 3 per scale in the inflorescence; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.5-1.8 mm long, persistent; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.8 mm long, inferior; **fruit** 4-6 (6.5) mm long, 3.5-4.5 mm broad, dark brown at maturity; only 1 straight **seed** developing, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** of several scale-like tepals adnate to the ovary, forming a membranaceous or short-fringed margin at its apex; **female inflorescence** a pendulous, subsessile, more or less irregular, lax, bracteate catkin, borne singly at the apex of new growth, 1-3 cm long, 4.0-5.5 mm broad at anthesis; **scales** 3-lobed; **peduncle**, 1-2 mm long; **fruiting catkins** pendulous, subsessile, irregularly strobiloid, (3) 4.5-7.5 (12.5) cm long, 2.5-4.5 cm broad, becoming light brown and shattering with the fruits in the late fall, lax, consisting of racemose clusters of paired fruits, each pair subtended by an expanded foliaceous scale; **scales** coriaceous, 3 lobed, asymmetrical, (1.5) 2.5-3.5 (4) cm long, (1.1) 1.8-2.8 cm broad (from tip to tip of the lateral lobes), the lobes divergent near the base, the central lobe broader and much longer than the lateral, tapering to an acute to more or less rounded apex, often with 1 to several coarse teeth along its outer margin; **peduncle** 1.0-2.2 cm long, 1.0-1.5 mm broad; **male flowers: florets** sessile, crowded, 3 per inflorescence scale (not readily apparent); **stamens** 3-4 (6) per floret; **anthers** cylindrical, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, each crowned with a tuft of long hairs at the summit, dehiscing longitudinally; **filaments** 0.3-0.7 mm long, undivided or divided to about one fourth of their length; **perianth** absent or of minute

scales; **male inflorescences** slender, pendulous, cylindric, relatively lax, bracteate catkins, 2-5 cm long, 5-7 mm broad, composed of 3-flowered cymules subtended by 3 fused bracts, borne singly from lateral buds below the females, formed the season before blooming but concealed in bud during the winter; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 2-4 mm long, ca. 1.5 mm broad; **leaves** alternate, distichous, mostly borne laterally on short shoots, blades thin, broadly ovate or elliptic to narrowly elliptic, (5.8) 8-10 (12.5) cm long, (2.5) 3.5-5.0 (6) cm broad, coarsely and unevenly doubly serrate, apex usually abruptly subcaudate, but sometimes more gradually tapering, the base rounded to cordate, upper surface mostly glabrous, the lower usually sparsely pubescent, with sparsely distributed small black glands, moderately pubescent to tomentose along major veins and in vein axils; **petioles** terete, (0.7) 1.2-1.5 (2.5) cm long, glabrous; **fall color** yellowish-brown, orange-brown or dull yellow; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, more or less 4-angled in cross section, appressed to the twig, 3-4 mm long, 1.5-2.5 mm broad, apex acuminate, the **bud scales** numerous, imbricate, smooth, reddish- brown; **stipules** broadly ovate, obtuse, 6-9 mm long, 2.5-4.0 mm broad, ciliate, greenish or light brown; **branches** distinctly distichous, with poorly-defined long and short shoots, pendulous at the ends; young **twigs** terete, glabrous to sparsely pubescent, dull bluish-gray, lacking conspicuous lenticels; **leaf scars** somewhat raised, crescent shaped, with 3 nearly evenly-spaced, inconspicuous, elliptic to circular vascular bundle scars; **pith** pale, continuous, circular to obscurely triangular; **bark** smooth, thin, tight, light bluish gray, without conspicuous **lenticels**; **trunk** usually 1, shallowly to deeply and irregularly fluted with "muscle-like" bulges and ridges, frequently crooked or leaning, up to 35 cm in diameter (maximum about 50 cm); **crown** open, round to flat-topped; a small spreading tree, the branching deliquescent, up to 12 m tall; **root system** shallow, spreading (2n = 16).

Infraspecific Variation and Hybridization: The American hornbeam is usually a small tree of the forest understory along streambanks; it is readily recognized by its blue-gray, muscle-like, fluted trunks. In flatter, more open habitats, such as level, open floodplains, it sometimes becomes a much taller tree with a fairly straight bole. The leaves of ssp. *virginiana* are most often abruptly narrowed to a sharp pointed apex, and the margins are usually irregularly and sharply doubly serrate (the primary and secondary teeth being almost equal in length); however, leaves with more tapering tips and more differentiated and regular teeth may also be found. The group also varies regionally. Plants in the Maritime Region, as well as those from the western part of the range, have larger and broader leaves, while those in the Southern Appalachians have noticeably smaller foliage. Two widespread, geographical variants of this species occur in eastern North America. Populations occurring throughout New York State all belong to subspecies *virginiana* (Marsh.) Furlow, the typical form of the Appalachians and northern Interior. Subspecies *caroliniana* has smaller leaves with acute tips and (usually) much smaller teeth; it ranges throughout the Gulf and Atlantic Coastal Plain, extending as far north in the East as Maryland. Although this subspecies does not reach New York, signs of introgression with it are sometimes evident in plants from New Jersey and Long Island (see Furlow, 1987b).

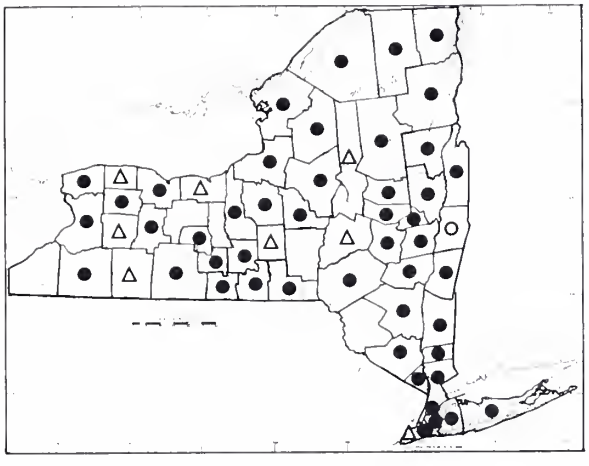
Importance: The American hornbeam is of limited economic value, due to its small size, sporadic occurrence and twisted shape; however, the extremely hard and heavy wood has found limited use in the making of wear-resistent wooden objects such as mallets, tool handles and carved figures. It is occasionally cultivated, and, when grown in the open, it may develop into an interesting, small tree, but it is too short-lived to be of significant popularity horticulturally. Along streambanks, hornbeams contribute to erosion control, even though they don't occur in dense stands.

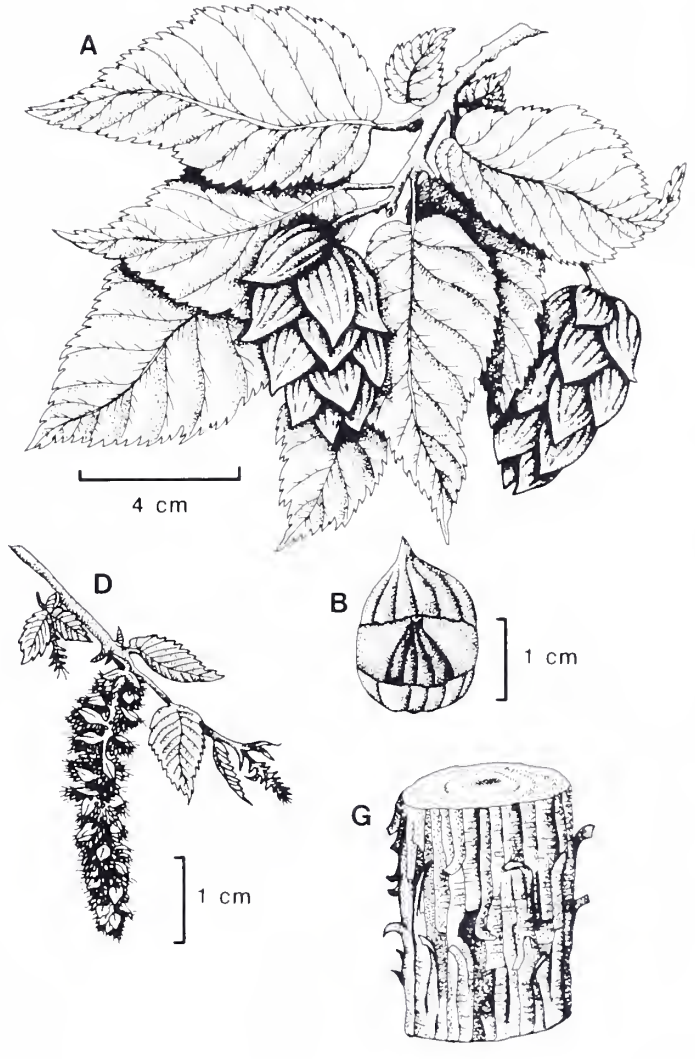
4. OSTRYA

Common Names: Hop Hornbeam, Ironwood
Authority: Scopoli, Fl. Carniolica, ed. 2, II, p. 243, 1772
A genus of about five species of small to medium sized trees of the North Temperate Zone, *Ostrya* is very closely related to *Carpinus* and similar to it in most features; however, the foliaceous scales of the fruiting clusters completely enclose the fruits in papery bladders in *Ostrya*, reminiscent of the fruiting bracts of hops. Members of the genus occur throughout the Northern Hemisphere in drier habitats than *Carpinus*, and also range into the cool, moist forests of the mountains of Mexico. Like the hornbeams, their wood is very heavy and hard. Several species, including our native *Ostrya virginiana*, are occasionally cultivated.

Description: Plants monoecious; **female florets: stigma** 1 per style; **styles** 2, narrowly cylindric, persistent in fruit; **ovary** 1 per floret, cylindric, inferior; **ovules** 2, only 1 usually developing; **fruit** a tiny, ovoid, dark brown, hard-shelled nutlet, dorsoventrally compressed, crowned by the persistent styles; **seed** 1, closely invested and filling the fruit; **embryo** large, straight with flat cotyledons; **endosperm** thin, nuclear; **perianth** of several reduced, scale-like tepals in a membranaceous fringe at the summit of the ovary; **female inflorescences:** lax, pendulous, uncrowded strobiloid catkins, borne singly at the tips of new-growth shoots in spring; **scales** consisting of 3 partially-united bracts which encircle 2 florets, later expanding to enclose them, becoming foliaceous in fruit; **peduncle** short, flexuous; **male florets: stamens** 3 (6); **filaments** short, divided nearly to the base; **anthers** 2-chambered, divided longitudinally into 2 separate 1-chambered parts, apically-tufted; **perianth** absent; **male inflorescences:** pendulous cylindric uncrowded catkins borne in small terminal clusters of 2-4 with numerous helically-arranged **scales** composed of 3 partially-united bracts and each bearing a cymule of 3 very crowded florets, in our species catkins formed the season before blooming and exposed through the

winter; **peduncles:** short, stiff; **buds** sessile, ovoid, more or less square in cross section, scales many, imbricate, smooth-surfaced; **leaves** simple, alternate, strongly 2-ranked, narrowly to broadly ovate or elliptic, doubly and usually irregularly serrate with strong, parallel secondary veins diverging from a strong midrib; **petioles** usually short, rather stiff; **stipules** present, deciduous; **twigs** terete, reddish-brown to gray, slender in cross-section with circular pith; **bark** thin, smooth, tight, brown to brownish gray, dull, with small, circular, inconspicuous **lenticels**, shredding vertically with age into irregular narrow scales; **trunk** usually straight, short, with a round spreading **crown**; **root system** shallow, spreading.





1. *Ostrya virginiana* (Mill.) K. Koch

Common Names: Hop Hornbeam, American Hop-hornbeam, Ironwood, Bois de Fer (Quebec)

Type Description: Miller, Gard. Dict. Ed. 8, #4, 1768

Synonyms: *Carpinus ostrya* Marsh., not L., *C. ostrya americana* Michx., *C. virginica* Muench., *Ostrya ostrya* MacM., *O. virginica* Willd.

Origin: Eastern North America

Habitats: In rich, dry to moist woodlands, especially on well drained crests and hillsides; very lime tolerant

Habit: A small to medium sized tree, often with a short, straight trunk and broad, rounded crown

Flowering: April-May

Fruiting: September-October

General Distribution: Nova Scotia west to Manitoba, south to Missouri and Oklahoma, Tennessee, Virginia and mountainous Georgia

Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 3 per scale in the inflorescence; **styles** 2, free, linear, apically stigmatic, reddish when receptive, 0.5-1.8 mm, persistent long; **ovary** 1 per floret, cylindric, 2-locular at base, 1-locular above, ca. 1 mm long, inferior; **fruit** 4-7 (8) mm long, 3.5-5.0 mm broad, dark brown at maturity; 1 straight **seed** developing, filling the fruit, anatropous, with a membranaceous testa and large, flat, fleshy cotyledons, partially overlapping and enclosing the short stalk; **perianth** of several scale-like tepals adnate to the ovary and apparent as a membranaceous or short-fringed margin at its apex; **female inflorescence** a pendulous, subsessile, often irregular, lax, bracteate catkin, borne singly at the apex of new growth, 0.8-1.5 cm long, 4.0-5.5 mm broad at anthesis, the **scales** lanceolate; **peduncle**, 1-2 cm long, 1.0-1.5 mm in diameter; **fruiting catkins** pendulous, subsessile, irregularly strobiloid, lax, consisting of racemose clusters of paired fruits, each pair completely enclosed in an expanded membranaceous sac-like involucre composed of the 3 united bracts, (3) 3.5-5.0 (6.5) cm long, 1.5-2.5 cm broad, becoming tan or light brown and dehiscing with the fruits in late fall; **fruiting scales** fused into flattened, inflated, bladder-like enclosures, broadly ovoid, papery, 1.0-1.8 cm long, 0.8-1.0 cm broad, very light brown; **peduncle** 1.5-2.5 cm long, 1.0-1.5 mm broad; **male flowers: florets** sessile, crowded, 3 per inflorescence

scale (not readily apparent); **stamens** 3-4 (6) per floret; **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, each crowned with a tuft of long hairs at the summit, dehiscing longitudinally; **filaments** 0.3-0.7 mm long, undivided or divided to about one fourth of their length; **perianth** absent; **male inflorescence** a slender, pendulous, cylindric, relatively lax, bracteate catkin, 2-5 cm long, 5-7 mm broad, composed of 3-flowered cymules subtended by 3 fused bracts, borne singly from a lateral bud below the females, formed the season before blooming but concealed in bud during the winter; **scales** (primary bracts) broadly ovate, acute; **peduncle** glabrous, 2-4 mm long, ca. 1.5 mm broad; **leaves** alternate, distichous, usually borne laterally on short shoots, blades thin, narrowly ovate or elliptic to oblong-lanceolate, (7) 8-10 (12.5) cm long, (3.5) 4-5 (6) cm broad, sharply and unevenly doubly serrate, apex usually acute or gradually tapering, the base rounded, cordate, or cuneate, upper surface dark yellowish green, dull, mostly glabrous, the lower light yellowish green, usually sparsely pubescent, moderately pubescent to tomentose along the major veins and in vein axils; **petioles** terete, short, (5) 7-10 cm long, moderately pubescent; **fall color** yellowish brown or dull yellow; **terminal bud** absent; **lateral buds** sessile, ovoid, slender, more or less 4-angled in cross section, appressed to the twig, 7-9 mm long, 1.5-2.5 mm broad, the apex acuminate, **bud scales** numerous, imbricate, smooth, reddish-brown; **stipules** oblong, rounded at the tip, 6-9 mm long, 2.5-4.0 mm broad, ciliate, greenish or light brown; **branches** distinctly distichous, often with poorly-defined long and short shoots, pendulous toward the tips; young **twigs** terete, sparsely to moderately pubescent, dark red-brown, lacking conspicuous lenticels; **leaf scars** somewhat raised, crescent-shaped to suboval with 3 nearly evenly-spaced, inconspicuous, elliptical to circular vascular bundle scars; **pith** pale, continuous, circular to obscurely triangular; **bark** of young branches and trunks smooth, thin, tight, light grayish-brown, without conspicuous **lenticels**, shredding into narrow rather ragged strips at maturity; **trunk** 1, usually short, straight, 30-50 cm in diameter (maximum about 60 cm); **crown** open, narrow to broad, rounded, a small spreading tree, the branching deliquescent, up to 15 (18) m tall, but usually much shorter; **root system** shallow ($2n = 16$).

Variation and Hybridization: The American hop hornbeam becomes a medium-sized tree with a long straight bole and narrow crown under forested conditions, but when open-grown it is usually much smaller, with a very short trunk, larger limbs and a broad, spreading crown. Excessive variation is not noted in this species within our range, but along the southeastern Coastal Plain there is as a race with much smaller, more pubescent leaves.

Importance: *Ostrya virginiana* is not plentiful enough to be of much economic significance. Its extremely hard wood is used to make such items as mallet heads and butcher blocks, and it is used in small quantities for carving and turning. The trunks also serve such utility purposes as fence posts. North American Indians and early settlers used the bark and wood to prepare decoctions used to treat malaria, dyspepsia, and other maladies. The trees are frequent subcanopy components, particularly in limey soils, throughout the eastern deciduous forest region, and edible parts, such as the fruits, buds, and catkins, are browsed by many kinds of birds and small mammals.

Taxonomic Note: The leaves of *Ostrya virginiana* are difficult to distinguish from those of *Carpinus caroliniana*, but the two species are easily identified in the field by their fruiting catkin scales (bladder-like in *Ostrya virginiana* and flat and open in *Carpinus caroliniana*) and distinctive bark (longitudinally shredding in *Ostrya virginiana* and smooth in *Carpinus caroliniana*). Vegetative material can also be distinguished by the bud scales, which are longitudinally striated in *O. virginiana*.

5. CORYLUS

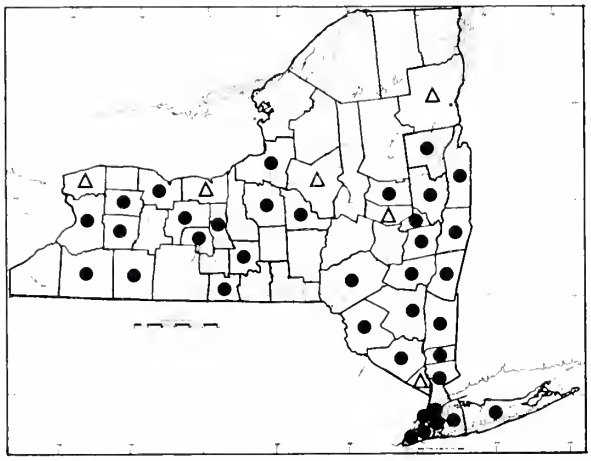
Common Names: Hazel, Hazelnut
Authority: Linnaeus, Species Pl. II, p. 998, 1753
Corylus is genus of about 15 species of shrubs and small trees, distributed throughout the temperate Northern Hemisphere. In our range, the hazels are thicket-forming shrubs, found at the edges of woods and on dry open rocky substrates. The cultivated filbert is obtained from several European and Middle Eastern species, including shrubby *Corylus avellana* L. and two tree-like species, *C. colurna* L. and *C. maxima* Mill. These are also cultivated as landscape plants, represented by a number of horticultural forms.

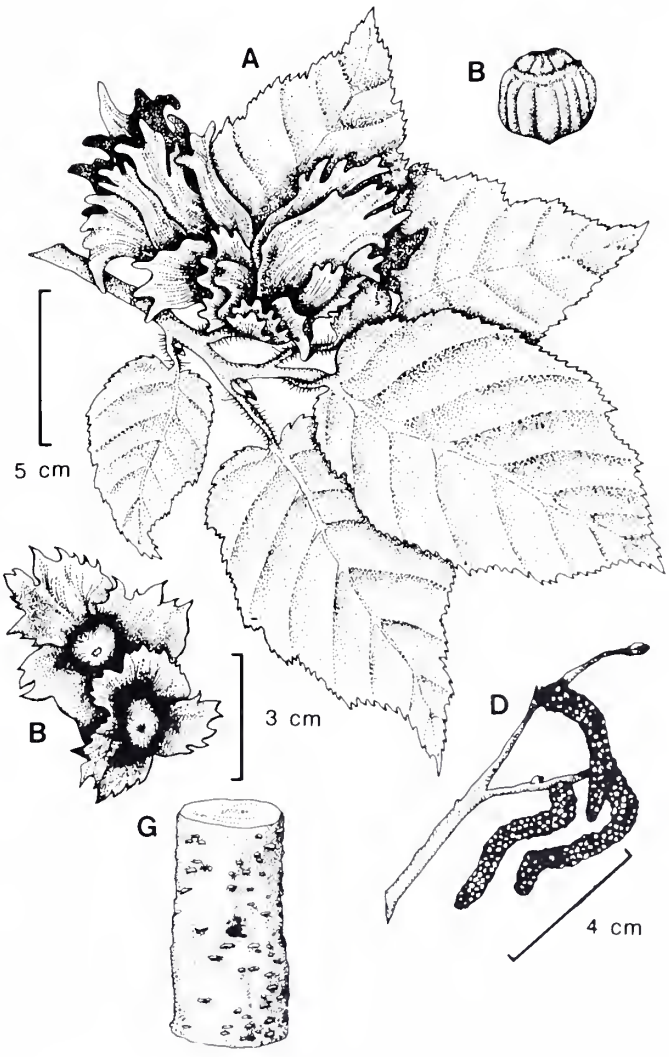
Description: Plants monoecious; **female florets: stigma** 1 per style; **styles** 2, narrowly cylindric, persistent in fruit; **ovary** 1 per floret, cylindric, inferior; **ovules** 2, only 1 usually developing; **fruit** a relatively large, thin-shelled nut, laterally compressed, longitudinally striated; **seed** 1, closely invested within and usually only partially filling the fruit; **embryo** large, straight, with greatly expanded, oily cotyledons; **endosperm** thin, nuclear; **perianth** of several reduced scale-like tepals, these apparent as a membranaceous fringe at the summit of the ovary; **female inflorescences:** highly reduced clusters of several florets, borne singly and completely enclosed within scaly buds near the ends of branchlets, only the styles protruding from the tip; **involucre** of several bracts subtending 2 florets, expanding to become 2 large, foliaceous scales in fruit, mostly separate or united into a narrow tube and variously dissected at the apex; **peduncle** short, stiff; **male florets: stamens** 4; **filaments** short, divided nearly to the base; **anthers** 2-chambered, divided longitudinally into 2 separate 1-chambered parts; **perianth** absent; **male inflorescences:** pendulous, cylindric catkins borne laterally in clusters of 1-2 (4), formed the season before blooming and exposed through the winter with numerous helically-arranged

scales composed of 3 partially-united bracts, each bearing a cymule of 3 crowded florets; **peduncles:** short, stiff; **buds** sessile, ovoid, scales many, imbricate; **leaves** simple, alternate, more or less 2-ranked, narrowly to broadly ovate, doubly and usually irregularly serrate with strong secondary veins diverging from a strong midrib, the lower veins often sharply ascending, the upper parallel; **petioles** usually short, rather stiff; **stipules** present, deciduous; **twigs** terete, reddish-brown to gray, slender, in cross-section with circular pith; **bark** thin, smooth, tight, brownish to gray, dull, with small circular inconspicuous **lenticels**; **stems** usually straight, ascending, with an rounded spreading **crown**; **root system** shallow, spreading.

KEY TO SPECIES OF CORYLUS

1. Branchlets and petioles densely covered with bristly, glandular hairs; the apices of winter buds acute; fruits surrounded by an involucre of two expanded, foliaceous bracts, separate nearly to their bases, about twice as long as the nut .....1. *C. americana*
1. Branchlets and petioles glabrous or sparsely pubescent, without glandular hairs; apices of the winter buds rounded; fruits surrounded by a narrow, tubular involucre more than twice as long as the nut .....2. *C. cornuta*





1. *Corylus americana* Walt.

Common Names: American Hazel, Hazelnut

Type Description: Walter, Fl. Carol. p. 236, 1788

Synonym: *Corylus humilis* Willd.

Origin: Eastern North America

Habitats: Moist to dry, open thickets

Habit: A large shrub with ascending, upright branches

Flowering: February-April

Fruiting: August-September

General Distribution: Central Maine to Saskatchewan, south to Missouri, Oklahoma and Georgia

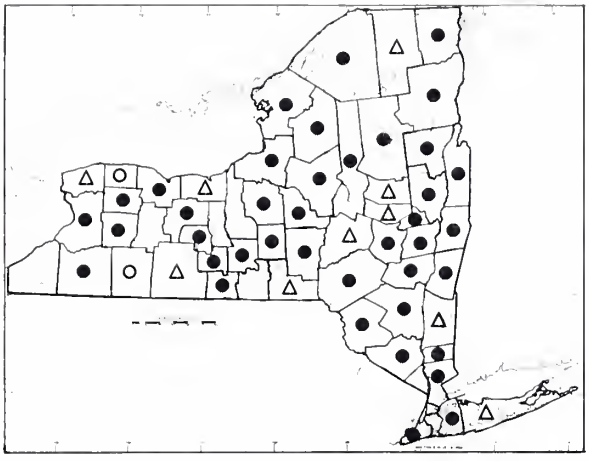
Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 2 per inflorescence; **styles** 2, free, linear, apically stigmatic, dark red when receptive, 1.0-1.8 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, inferior; **fruit** (1) 1.2-1.5 cm long, 1.0-1.8 cm broad, light brown; 1 straight **seed** developing, filling the shell, anatropous, with a membranaceous testa, the cotyledons thick and oily; **perianth** represented by an irregular, membranaceous fringe at the summit of the ovary; **female inflorescence** a small sessile cluster of reduced florets and bracts (1 or 2 cymules), 3-5 mm long, 3.5-5.0 mm broad, completely enclosed by bud scales with only the styles protruding at anthesis, formed the season before blooming and exposed during the winter; borne singly near the ends of branchlets above the males; **fruiting catkin** a compact, sessile cluster of 2-6 fruits, each surrounded by an involucre

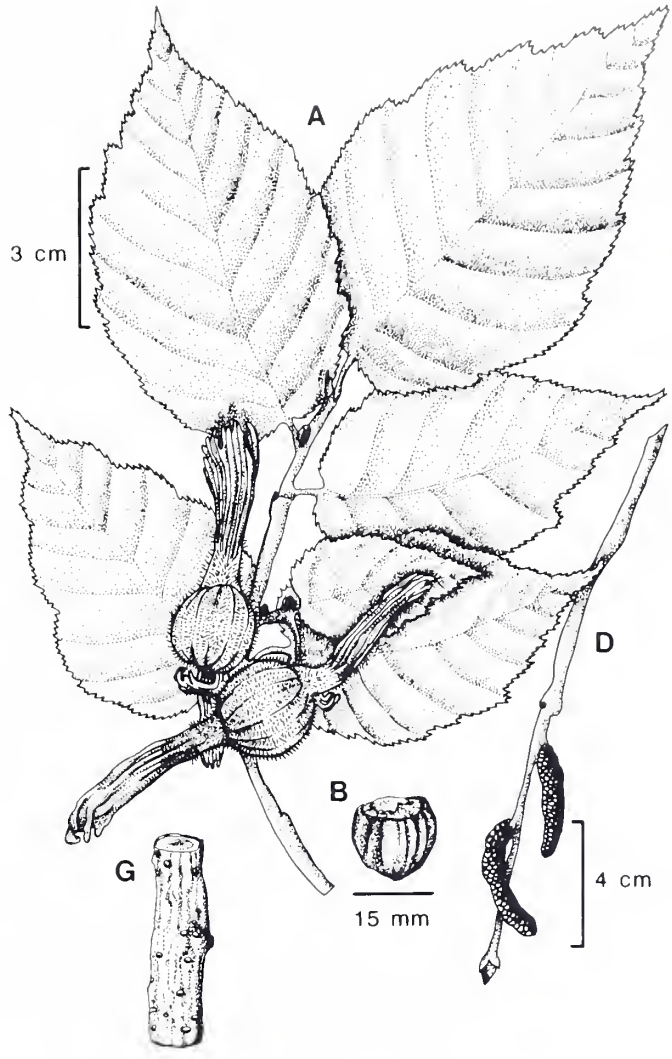
of 2 much enlarged, light green, foliaceous, downy-pubescent bracts, the pubescence containing glandular hairs, the bracts about twice as long as the fruits, expanded and deeply and irregularly laciniate at the apex, 2-4 (5) cm long 2.0-2.5 cm broad, turning light brown and falling away with the fruits at maturity; **male flowers: florets** reduced, subsessile, 3 per scale in the inflorescence; **stamens** 4 per floret, opposite the tepals (if tepals present); **anthers** cylindrical, 2-chambered, ca. 2 mm long, divided longitudinally into two separate 1-chambered parts, dehiscing longitudinally; **filaments** very short, fused to the inflorescence bracts; **perianth** usually absent, occasionally of 4 minute, greenish tepals; **male inflorescences** slender, pendulous, short-peduncled cylindric, densely bracteate catkins, 4-8 cm long, 5-8 mm broad at anthesis, composed of 2-flowered cymules subtended by 3 partially fused bracts, borne laterally along the branches in racemose clusters of 1-2 (3), below the female inflorescences on the same branches, formed the season before blooming and exposed during the winter; **scales** (primary bracts) broadly ovate with long-pointed tips, the bracteoles (secondary bracts) usually surpassing the main scale; **peduncle** 2-5 mm long, 1.5-2.0 mm broad; **leaves** alternate, subdistichous, blades somewhat leathery, broadly ovate, often with more or less straight sides and abruptly tapering apices and bases, giving them a "squarish" or hexagonal appearance, coarsely and often irregularly doubly serrate, the apex abrupt- to long-acuminate, the base narrowly cordate to narrowly rounded, 6-16 cm long, 4-12 cm broad, upper surface nearly glabrous, the lower sparsely to moderately pubescent, more or less tomentose along the major veins and in vein axils; **petioles** short, terete, 0.3-2.4 cm long, pubescent and densely glandular-bristly; **fall color** brownish yellow; **terminal bud** absent; **lateral buds** sessile, broadly ovoid, terete, 3-5 mm long, 3-4 mm broad, the apex acute, **bud scales** several, broadly ovate, smooth, light reddish brown; **stipules** oblong, ca. 5 mm long and broad, greenish; **branches** subdistichous to more or less diffuse, usually indistinctly differentiated into long and short shoots; young **twigs** terete, densely covered with glandular hairs, gray to grayish brown, without conspicuous lenticels; **leaf scars** suboval to triangular, with 3 nearly equidistant circular to elliptic bundle scars; **pith** pale, continuous, circular to remotely triangular; **bark** thin, smooth, tight, gray, without prominent **lenticels**; **stems** several, ascending, reaching 3 cm in diameter (maximum about 5 cm); **crown** rounded, a medium-sized upright shrub, the branching deliquescent, up to 4 (5) m tall; **root system** shallow (2n = 22).

Variation and Hybridization: The leaves of *Corylus americana* vary from broadly ovate to elliptic, usually with very abruptly narrowing apices and shallowly cordate bases. They are often more or less squarish (or hexagonal) in outline due to their angled margin and relatively straight edges, and this trait gives them a distinctive aspect. Fruiting bracts are typically separate nearly to the base, but sometimes they may be partially or wholly connate along one or both sides (var. *indehiscens* Palmer & Steyerm.). Hybridization has not been noted between *C. americana* and other *Corylus* species.

Importance: The American hazel forms thickets in open places, providing cover for wildlife. It is a successional species, appearing mostly at the edges of woods, in openings and on disturbed sites. It may also become a weed along fences, in pastures, and in other open areas. The nuts are eagerly collected by squirrels, often before they fully ripen. The species is not generally cultivated, though wild hazelnuts, which are slightly smaller but have the same flavor as domestic filberts, are collected and used by people in rural areas.

Note: The American hazel is a common shrub along roadsides, fencerows, and the borders of woods, especially in the southern part of the State. It becomes less frequent in the western counties and rare in pine barrens of Long Island. The female inflorescences of hazels are extremely reduced and wholly contained within scaly buds growing on short shoots along the branches. They are only apparent at the time of blooming, recognized by red styles that protrude from the apex of the buds. Blooming occurs earlier than in most other woody plants, sometimes as early as mid- or late February. This species is easily distinguished from the beaked hazel, *C. cornuta*, when in fruit, by the broad leafy involucre of two bracts surrounding the fruit. Although the two shrubs are similar vegetatively, they may be distinguished with a hand lens by noting the presence of both gland-tipped and non-glandular hairs on the petioles in *C. americana* and of only non-glandular hairs in *C. cornuta*.





2. *Corylus cornuta* Marsh.

Common Names: Beaked Hazel or Hazelnut

Type Description: Marshall, Arbust. Amer. p. 37, 1785

Synonym: *Corylus rostrata* Ait.

Origin: Northern North America

Habitats: Open thickets, edges of woods, and as an understory element in open woods.

Habit: A large shrub with a rounded crown

Flowering: March-May

Fruiting: August-September

General Distribution: Newfoundland to southern British Columbia, south to Colorado, eastern Kansas, Missouri, Tennessee and Georgia

Description: Plants **monoecious**; **female flowers: florets** reduced, sessile, usually 2 per inflorescence; **styles** 2, free, linear, apically stigmatic, dark red when receptive, 1-2 mm long; **ovary** 1 per floret, cylindric, 2-locular at the base, 1-locular above, ca. 0.5 mm long, inferior; **fruit** 1.2-1.5 cm long, 1.0-1.8 cm broad, light brown; 1 straight **seed** developing, filling the shell, anatropous, with a membranaceous testa, the cotyledons thick and oily; **perianth** represented by an irregular, membranaceous fringe at the summit of the ovary; **female inflorescence** a small, sessile cluster of reduced florets and bracts (1 or 2 cymules), completely enclosed by bud scales, only the styles protruding at anthesis, 3-5 mm long, 4-5 mm broad, formed the season before blooming and exposed during the winter, borne singly near branchlet tips above the males; **fruiting catkin** a compact, sessile cluster of 1 or 2 fruits, each surrounded by an involucre of 2 united, densely bristly, foliaceous bracts, narrowed and extended into a long tubular beak, 2-3 (4) times the length of the fruits, open and narrowly laciniate at the apex, 4-5 cm long, 3-5 mm cm broad, turning light brown and falling away with the fruits at maturity; **male flowers: florets** reduced, subsessile, 3 per inflorescence scale; **stamens** 4 per floret, opposite the tepals (when tepals present); **anthers** cylindric, 2-chambered, ca. 2 mm long, divided longitudinally nearly to the base to form 8 half-anthers, dehiscing longitudinally; **filaments** very short, fused to the inflorescence bracts; **perianth** usually absent, occasionally of 4 minute, greenish tepals; **male inflorescences** slender, pendulous, subsessile, cylindric, densely bracteate catkins, 4.5-6.0 cm long, 5-8 mm broad at anthesis, 2-flowered cymules subtended by 3 partially fused bracts; **scales** (primary bracts) broadly ovate, short-pointed at the apex, the bractcoles (secondary bracts) about the same length as the main scale borne laterally along the branches in racemose clusters of 2-4 on short shoots, occurring below the female inflorescences on the same branches, formed the season before blooming and exposed during the winter; **peduncle** 0.5-1.0 mm long, 1.0-1.5 mm broad; **leaves** alternate, subdistichous, borne on indistinct long and short shoots, blades leathery, narrowly ovate, sometimes with rather straight sides and narrowed apices and bases, giving them a squarish or hexagonal appearance, coarsely and often irregularly doubly serrate, apex acute to acuminate, the base rounded to narrowly cordate, 5-13 cm long, 3.5-8 cm broad, upper surface mostly glabrous, the lower generally glabrous, sparsely to moderately pubescent along the major

veins and in vein axils; **petioles** short, terete, 0.8-1.2 cm long, sparsely to moderately pubescent, not glandular; **fall color** greenish brown to dull yellow; **terminal bud** absent; **lateral buds** sessile, broadly ovoid, terete, 3-5 mm long, 3-4 mm broad, apex acute, the **bud scales** several, broadly ovate, smooth, light reddish-brown; **stipules** broadly ovate, 3-5 mm long, 3-4 mm broad, greenish; **branches** subdistichous to more or less diffuse, usually indistinctly differentiated into long and short shoots; young **twigs** terete, mostly glabrous to sparsely pubescent, not glandular, grayish- brown, without conspicuous lenticels; **leaf scars** suboval to triangular with 3 nearly equidistant circular to elliptical bundle scars; **pith** pale, continuous, circular to remotely triangular; **bark** thin, smooth, tight, gray, without prominent **lenticels**; ; **trunks** several, ascending, to about 4 cm in diameter (maximum about 6 cm); **crown** rounded, the branching usually deliquescent, a medium-sized to large spreading shrub up to 6 m tall; **root system** shallow, spreading (2n = 22).

Infraspecific Variation: The leaves of *Corylus cornuta* vary somewhat in shape, from rather narrowly to quite broadly ovate, and the major teeth of the margin vary from large and coarse to relatively small and indistinct. The involucre surrounding the nuts is always completely united and very narrow, but it ranges considerably in length, from just a little longer than the nuts to three or more times as long.

Importance: This species, like the American hazel, is a successional element and forms thickets in open places. It is a characteristic understory plant in the northern conifer forest, and is regarded there by foresters as a weed in carefully managed plantations. The nuts are similar to those of *C. americana* and are consumed by birds, squirrels and other rodents, and sometimes by larger mammals such as deer. Local residents also collect the nuts and use them in the same ways as domestic filberts.

Note: *Corylus cornuta* resembles *C. americana* vegetatively except that the leaves are slightly smaller and narrower. These, as in *C. americana*, sometimes have an angular outline, but the tip is less abruptly narrowed and the shape of the blade is generally more regular in appearance. Vegetative individuals of *C. cornuta* are sometimes difficult to distinguish from *C. americana*, but they can be identified by their lack of glandular hairs on the petioles and internodes of the young twigs. Beaked hazel is common throughout the northern half of the State, becoming less frequent to the south, and rare or absent in the western counties.

Phytolaccaceae (Pokeweed Family)

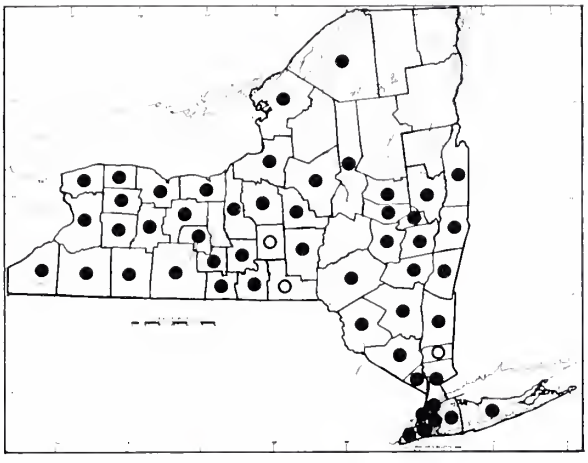
A family of 15-20 genera and over 100 species of herbs, shrubs and vines (rarely small trees), distributed primarily pantropically and especially common in the New World tropics. Some are succulent, and many contain saponins, resins and alkaloids that are poisonous.

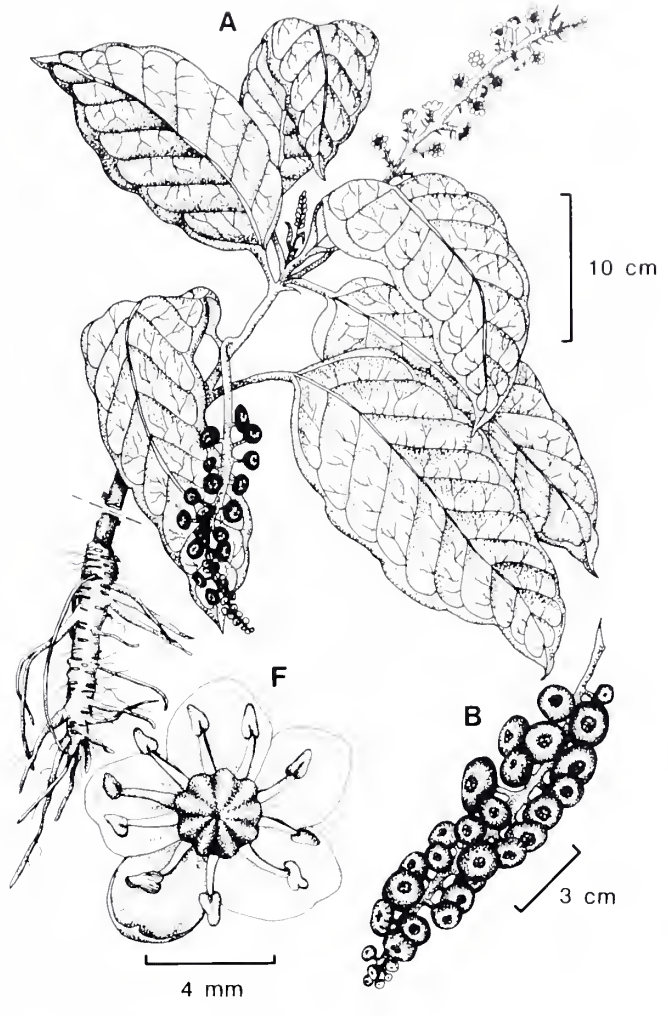
FAMILY DESCRIPTION

Herbaceous to woody plants with alternate leaves and no stipules. Some are succulent or scandent. Flowers are borne in axillary racemes or spikes (less often in panicles, cymes or few in the upper leaf axils), perfect, or unisexual in monoecious plants, usually radially symmetrical and hypogynous. The perianth is a single series of sepals that may be free or connate at base. Petaloid staminodia may be present. Sepals are 4-5 (-10), often petaloid. Stamens are as many as the petals, twice their number (in two whorls) or sometimes many. The nectary zone is continuous between the ovary and stamens, or individual nectaries encircle the stamen bases. Carpels are one to many, often partially fused at base to form a compound ovary; stigmas and styles are one per carpel; ovules are one per carpel, basal, amphitropous or campylotropous. The fruits are berries, utricles, schizocarps or drupes; seeds one per carpel (sometimes arillate), each with a large, curved embryo and starchy perisperm.

1. PHYTOLACCA

Common Names: Pokeweed, Poke, Scoke, Pokeberry, Pigeonberry
Authority: Linnaeus, Species Pl., p. 441, 1753
A genus of about 30 species of herbs, shrubs and small trees native to North and South America, Africa and Asia. Some are poisonous, but some, like our native species, *P. americana* L., are both poisonous and edible, depending upon their stage of development and the parts of the plant used. Some herbaceous species are cultivated for dyes and greens, and one small, South American tree, *P. dioica* L., is grown widely in the Mediterranean, where it also escapes.





1. *Phytolacca americana* L.

Common Names: Pokeweed, Poke, Scoke, Pocan, Virginia Poke, Garget, Pigeon-berry, Ink-berry

Type Description: Linnaeus, Species Pl. II, p. 441, 1753

Synonym: *P. decandra* L.

Origin: Eastern North America

Habitats: Clearings, rich bottomlands, fields, fencerows, borders, meadows and roadsides, sometimes becoming a troublesome, native weed in disturbed habitats

Habit: Robust, erect, perennial herbs (somewhat woody at base), much-branched above

Flowering: May-September

Fruiting: August-November

General Distribution: Quebec and Maine west to Minnesota, south to Mexico and the Bahamas

Description: Plants with bisexual flowers; **stigmas** 10 (5-12) minute, papillose on the inner margins of the styles; **styles** 10 (5-12), filiform, incurved, ca. 0.7 mm long; **ovary** 1, globose, of 5-12 fused carpels; **fruit** a red-purple to black, subglobose to compressed, juicy berry, 7-12 (16) mm long, 9-16 (22) mm broad, with floral remnants in a depression at the summit and 5-12 locules, each with a single seed; **seed** glossy, black, lenticular, 2.5-3.5 mm long and broad, ca. 2 mm thick; **stamens** 10; **anthers** minute, opening by slits; **filaments** distinct, thicker toward the base, 1.0-1.4 mm long, curved upward, persistent in fruit; **perianth** of a single series of petaloid sepals; **petals** absent; **sepals** usually 5, distinct, creamy, greenish to rose-tinged, obovate-obtuse (to apiculate), cucullate, 3-4 mm in diameter, drying to become reflexed and persistent in fruit; **pedicels** 5-15 mm long, ribbed, smooth; **peduncle** smooth, ribbed, 4-12 (17) cm long yellowish-green; **inflorescences** terminal and lateral racemes, the lateral ones opposite leaves, fruiting rachis 3-15 (22) cm long; **bracts** of pedicels and peduncles linear-lanceolate, ca. 1.5 mm long; **leaves** elliptic to ovate-lanceolate, 5-30 (46) cm long, 2-13 (-17) cm broad, tips acute to acuminate, bases cuneate to obtuse, surfaces glabrous, the upper darker green, margins entire; the foliage has a distinctive odor; **petioles** 1-4 (-8) cm long, ribbed, glabrous; **stipules** absent; **stems** yellow green toward the tips when mature, but young shoots are purplish, and mature plants are often deep purple below, ribbed to terete, somewhat woody near base, 1-2 (3.2) meters in height, with a more or less umbrella shaped **crown**; **root system** a hard-fleshy, pale, perennial taproot 1-15 (18) cm broad and up to 50 cm long, bearing fleshy to fibrous lateral roots (2n = 36).

Importance: All parts of the plant are poisonous to some degree, especially the tuberous root and mature foliage. They contain saponins, resins and the alkaloid Phytolaccine. The berries are less dangerous, but they have been reported to cause delirium and vomiting in children, despite the fact that they are enjoyed as food by song birds. A case of a death from ingesting berries was reported when a five year old child drank significant quantities of raw, squeezed juice; however, the berries are sometimes cooked

into pies without harmful results. The major cause of poisoning is use of the root or mature leaves as food. Symptoms are nausea, vomiting, perspiration, gastric cramps and diarrhea. The young leaves and stalks are often safely used as food after being boiled, if the first boil-water thrown out. Very young leaves are called salad or "salat" in the southeastern states, and this use of words has occasionally prompted uninitiated persons to poison themselves with mature leaves added to a salads. The canned greens are sold commercially. In the southeast, young shoots are also boiled and made into delicious pickles. The powdered root has been extracted for medicinal use as a purgative, alterant and emetic, but its use is questionable. The berries are a source of red-purple dye, used for staining cloth, fur and skins as well as for body decoration in pre-Columbian times. The dye has been used in confectionery and to color wines.

Nyctaginaceae (Four-o'clock Family)

A family of some 30 genera and up to 300 species, with two genera in the Old World, but distributed primarily in the American tropics. Fourteen of the genera are monotypic. The only genus represented in northeastern North America is *Mirabilis*. Our species are sometimes segregated (as *Oxybaphus*) from the true Four-o'clocks, which have a single flower per involucre, rather than several. New York State plants have migrated in from the central and western United States, where they are native. Some *Mirabilis* and several *Bougainvillea* species are common in cultivation, especially further south.

FAMILY DESCRIPTION

Herbs, shrubs or trees with opposite (rarely alternate) leaves and no stipules. The flowers are perfect (rarely functionally dioecious) with a single perianth whorl of connate, petaloid sepals. Flowers are borne several (or singly) on a rotate to campanulate involucre; involucres are often conspicuous, and may be green or highly colored. Inflorescences are composed of cyme-like or dense, head-like clusters of floriferous involucres. Stamens are as many as the perianth lobes (or fewer) and alternate with them, or in some species up to 20-30. Filaments are free or connate, sometimes of unequal lengths; anthers are tetrasporangiate, dithecal, dehiscing by slits. The ovary is single and superior, with one basal ovule. The fruits are achenes or nuts, often borne within a persistent calyx or involucre. The embryo is straight or curved, peripheral and adjacent to a starchy perisperm. True endosperm is lacking.

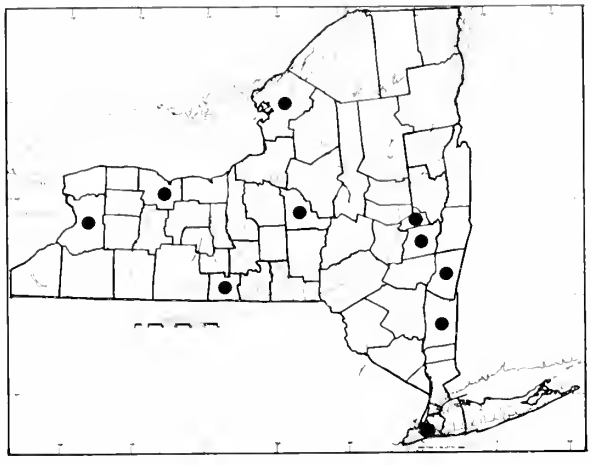
1. MIRABILIS

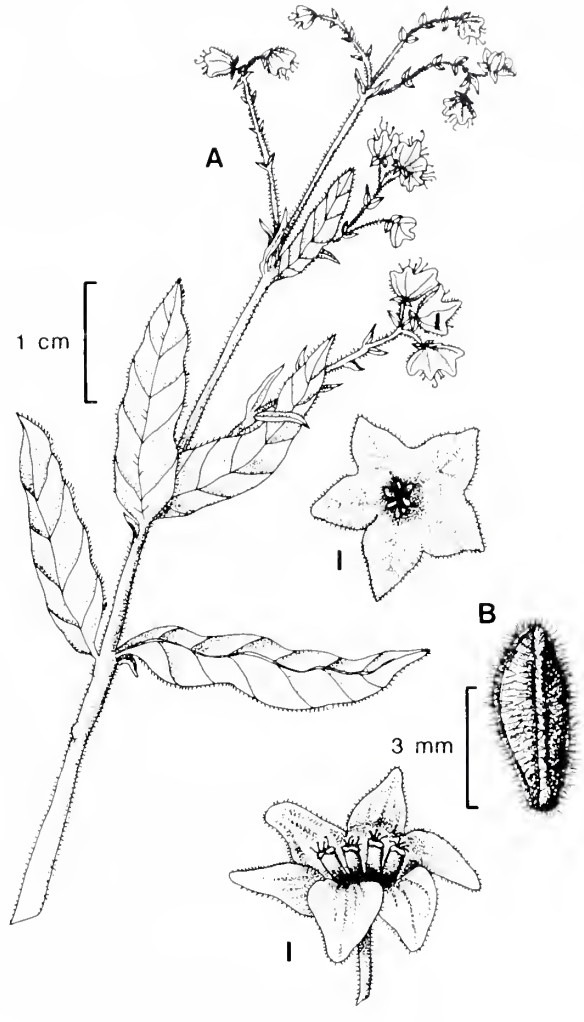
Common Names: Four-o'clock, Umbrella-wort
Authority: Linnaeus, Species Pl., p. 177, 1753
A genus of 50 or more species, primarily found in the American tropics and subtropics, but with one species reported as Himalayan, and several known from the arid, western United States to the Great Lakes. A few species are cultivated, and some species are weedy. *Mirabilis jalapa* L., is the Garden Four-o'clock. It has been implicated in cases of human poisoning and gastroenteritis.

Description: Plants with bisexual flowers; **stigma** small, capitate; **style** filiform; **ovary** 1, superior; **ovule** 1, basal; **fruit** indehiscent, single-seeded, ribbed, achene-like; **seed** 1 per fruit; **embryo** large, peripheral, curved; **endosperm** absent, but a starchy perisperm present; **stamens** 3-5, hypogynous; **filaments** slender; **anther sacs** dehiscing by slits; **perianth** of a single series; **petals** absent; **sepals** 5, petaloid, campanulate to salverform, with rounded or cleft, colored limbs, usually sessile within an involucre; **involucre** rotate to campanulate, lobed, bearing several flowers (or one, in which case it simulates a calyx); **peduncles** upright or drooping; **inflorescence** of compound cymes or more often paniculate clusters of involucres bearing 1 or more flowers each; **leaves** simple, opposite, often entire; **petioles** present or absent; **stipules** absent; **stems** herbaceous from a perennial **root system**.

KEY TO SPECIES OF MIRABILIS

1. Lower leaves sessile or very short-petioled, cuneate at base; younger stems hirsute, especially at the nodes .....1. *Mirabilis hirsuta*
1. Lower leaves with distinct petioles, often cordate or obtuse at base; young stems glabrescent .....2. *Mirabilis nyctaginea*





1. *Mirabilis hirsuta* (Pursh) MacM.

Common Names: Umbrella-wort, Hairy Umbrella-wort

Type Description: Pursh, Fl. Amer. Sept., p. 728, 1814

Synonyms: *Allionia pilosa* (Nutt.) Rydb., *A. hirsuta* Pursh, *Calymenia pilosa* Nutt., *Oxybaphus hirsutus* (Pursh) Choisy in DC.

Origin: Western North America (adventive in the east)

Habitats: Creek, pond and river banks, sandy fields, railroad tracks and other disturbed, open areas (an occasional weed)

Habit: Erect or ascending, perennial herbs

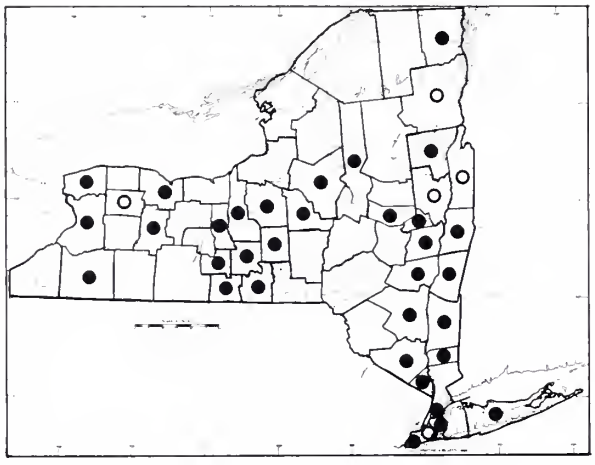
Flowering: June-October

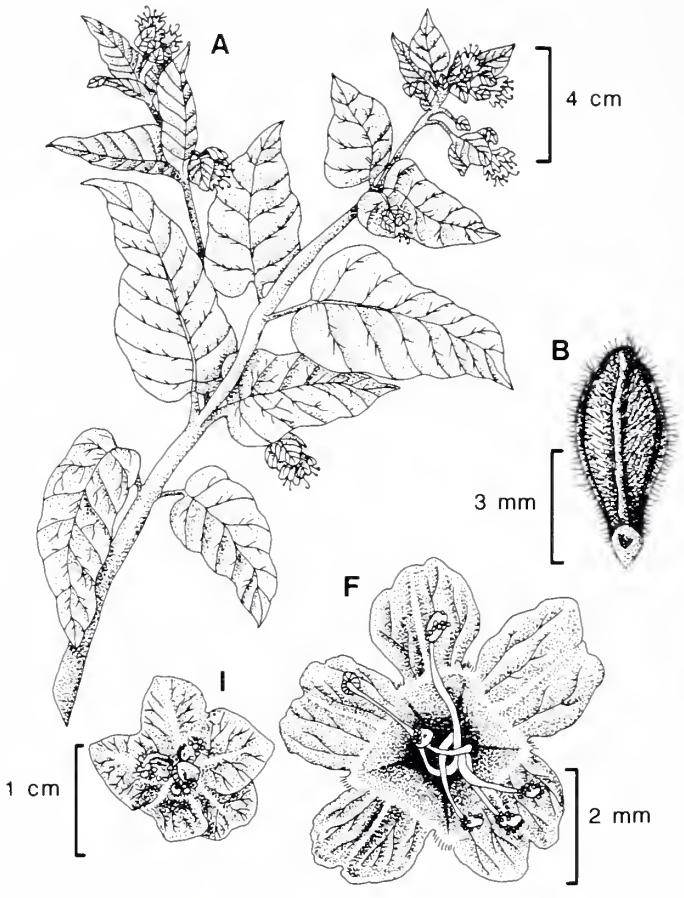
Fruiting: July-December

General Distribution: Wisconsin to Saskatchewan, south to New Mexico and Texas; adventive eastward to New England

Description: Plants with bisexual flowers; **stigma** 1, capitate; **style** filiform, 4-5 mm long; **ovary** 1, ovoid, unilocular; **fruit** a single nut-like achene, brownish, obovate, somewhat compressed, 5-ribbed, scabrous, ca. 5 mm long, 2 mm broad; **seed** 1, closely invested by the fruit; **stamens** (3-) 5, **anthers** minute, golden; **filaments** hypogynous, filiform, ca. 4 mm long; **perianth** of a single series; **sepals** fused into a tubular, petaloid calyx 4-6 mm long, 2 mm wide, with 5 obtuse limbs, outer surfaces lightly to densely hirsute-glandular, tube slightly constricted above the ovary, creamy or pale below to magenta, rose or purplish near the apex, subsessile within the involucre; **inflorescences** compound, a panicle of involucres with (2-) 4 (-5) flowers each; **involucre** accrescent, 1-2 cm broad in fruit, star-shaped, shallowly campanulate with five acute to obtuse lobes, greenish with rose tinges, densely glandular-hirsute with villous margins; **peduncles** 1-12 mm long, rosy, glandular-hispid; **inflorescence bracts** ca. 1.5 mm long and broad, ovate-acute, densely glandular; **leaves** opposite to subopposite, lance-ovate to linear lanceolate, tips acute, bases cuneate, the margins entire (or irregularly, shallowly toothed), surfaces pleated to bullate (on drying), glabrescent to densely glandular-hispid 2-10 cm long, 0.5-2.5 (3.5) cm broad; **petioles** 0-2 (-4) mm long; **stems** mostly terete, woody at base, glandular-hirsute, especially at the **nodes** and when young, erect or ascending to a maximum height of 1 meter from a tough caudex and **rhizome**; **root system** fibrous (2n = 58).

Importance: Other members of the genus are known to cause internal poisoning and gastroenteritis in humans.





2. *Mirabilis nyctaginea* (Michx.) MacM.

Common Name: Umbrella-wort

Type Description: Michaux, Fl. Bor. Amer. 1:100, 1803

Synonyms: *Allionia nyctaginea* Michx., *Calymenia nyctaginea* (Michx.) Nutt., *Oxybaphus floribundus* Choisy in DC., *O. nyctaginea* (Michx.) Sweet

Origin: Central North America

Habitats: Grasslands, roadsides and waste places

Habit: Erect or ascending perennial herbs

Flowering: June-October

Fruiting: July-December

General Distribution: Wisconsin to Montana and Manitoba south to Texas and Alabama (weedy eastward to the Atlantic Seaboard)

Description: Plants with bisexual flowers; **stigma** 1, capitate; **style** filiform, 6-11 mm long; **ovary** 1, obovoid, unilocular; **fruit** a single nut-like achene, brownish, obovate, somewhat compressed, 5-ribbed, scabrous, ca. 5 mm long, 2 mm broad; **seed** 1, closely invested by the fruit; **stamens** (3-) 5, **anthers** ca. 1 mm broad, golden; **filaments** hypogynous, filiform, 7-12 mm long; **perianth** of a single series; **sepals** fused into a funnelform, petaloid calyx 6 -10 mm long, 3-5 mm wide, with 5 obtuse to cleft limbs, outer surfaces glabrous or with a few hairs, dotted with elongate cystolyths visible when dry, tube slightly constricted above the ovary, creamy below to magenta, rose or purplish at the apex, with a star-shaped color pattern at the mouth, subsessile within the involucre; **inflorescences** compound, panicles of flowering involucres (also clusters in upper leaf axils) with (2-) 4 (-5) flowers per involucre; **involucre** accrescent, 1.0-2.5 cm broad in fruit, with five major, acute lobes and occasional sub-lobes or teeth, campanulate, greenish to rosy, glabrescent, but densely covered with linear to c-shaped cystoliths, and with villous margins; **peduncles** 2-14 mm long, rosy, minutely glandular-hispid; **inflorescence bracts** leafy, linear to lanceolate and up to 2 cm long; **leaves** opposite to subopposite, lance-ovate to broadly oval, tips acute to acuminate, bases cordate to obtuse, the margins entire (or irregularly, shallowly toothed), appearing irregular due to the broad bases of scabrous trichomes which line a hyaline to reddish rim, surfaces pleated to bullate (on drying), glabrescent, dotted with cystoliths, with a few hairs along the main veins, (leaves) 2-9 cm long, 1-4 (6.5) cm broad; **petioles** 0-18 (26) mm long, mostly ca. 1 cm on main stem leaves; **stems** somewhat angled and ribbed, woody toward the very base, glabrous to puberulent at **nodes** and when young, erect or ascending to a height of 1.6 meters from a tough caudex and **rhizome**; **root system** fibrous (2n=58).

Infraspecific Variation: The leaves are occasionally cuneate at base, but not usually consistently so over the whole plant.

Importance: Other members of the genus have been implicated in human poisonings and as causes of gastroenteritis when taken internally.

Note: *Mirabilis jalapa* L., Garden Four-o'clock, has been reported as a rare waif and garden escape in waste places. *Mirabilis linearis* (Pursh) Heim. was reported once, as an escape from cultivation on the beaches at Orient Point, Long Island.

Aizoaceae (Fig-marigold Family)

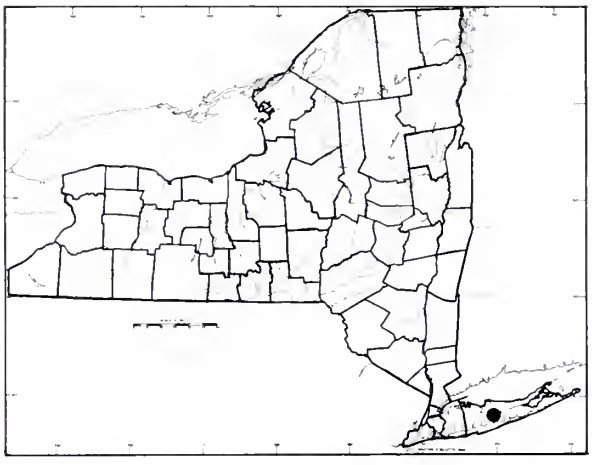
A family of mostly leaf-succulent plants, with 10-12 genera (excluding generic segregates of the large genus *Mesembryanthemum*) and about a thousand species (up to 2,500 described). Most of these are found in South Africa, but others are scattered from the dry tropics to southern temperate areas and elsewhere along sea coasts. They are popular horticultural subjects in rock gardens and terraria, and at least two species of *Mesembryanthemum* are used as ground covers and dune stabilizers along the western coast of North America.

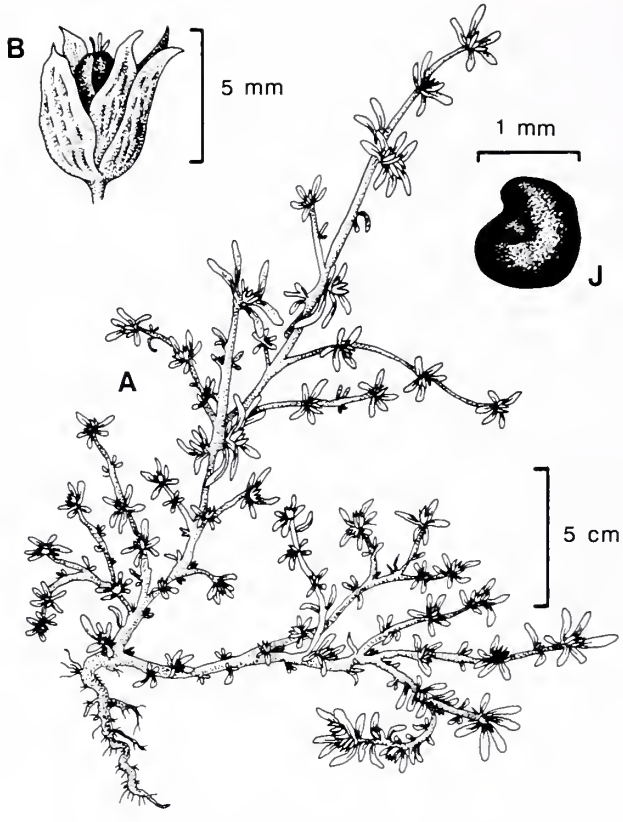
FAMILY DESCRIPTION

Annual or perennial herbs, subshrubs or small trees, often with succulent leaves. Spines are rarely present. Leaves are opposite (or alternate) usually entire, and, when succulent, frequently with centric, rather than bifacial morphology. Flowers are borne singly or in few-flowered cymes. They are perfect, or plants may be monoecious. The radially symmetrical flowers are perigynous to epigynous with 5 (3-8) sepals and few to many petals (or staminodes) attached at the rim of the hypanthium or summit of the ovary. Petals are usually free, but may be fused below (or absent). Stamens usually 4-5, 10 or numerous, the filaments attached at base to the petals, hypanthium or ovary summit. Ovary free from the hypanthium or more commonly partially to completely inferior with 2-many carpels and as many styles, which are free or fused at base. Ovules are often numerous, anatropous or campylotropous. The fruit is a capsule or it may be berry-like within a persistent hypanthium. Seeds 5-many (rarely 1), with a large, peripheral embryo and proteinaceous to oily or starchy perisperm. True endosperm is lacking.

1. SESUVIUM

Common Names: Sea Purslane
Authority: Linnaeus, Syst. Nat. ed. 10, vol. 2, p. 1058, 1759
A genus of 8-10 species, distributed in north Africa and in the New World tropics, ranging westward to California northward along the coast to New York. A close relative of the purslanes is *Aizoön hispanicum* L., carpetweed, with one species in the Mediterranean region. Our native *Sesuvium maritimum* L., may be distinguished from the common, southeastern *S. portulacastrum* (L.) L., by its sub-sessile flowers and fruits, as well as its annual taproot and more ascending habit, especially when young.





1. *Sesuvium maritimum* (Walt.) BSP.

Common Name: Sea Purslane

Type Description: Walter, Fl. Carol., p. 117, 1788

Synonyms: *Pharnaceum maritimus* Walt., *Sesuvium pentandrum* Ell.

Origin: Native to both North and South America

Habitats: Beaches, dunes, sandy, brackish shores

Habit: Spreading, decumbent to ascending or suberect

Flowering: June-October

Fruiting: July-December

General Distribution: Scattered from Long Island, New York southward along the coast to Florida (the Bahamas) and Texas, where it is more common

Rarity Status: This species is at the northern edge of its distribution range in New York State. It is currently known from a single healthy population on eastern Long Island with four other historical reports from that area. Ranked State endangered; NYNHP: G5, S1

Description: Plants with bisexual flowers; **stigmas** and **styles** 3 (-5) semi-persistent, withering in fruit, 0.3-0.6 mm long, linear to recurved; **ovary** 1, free, ovate-fusiform, 3-5 locular; **fruit** a greenish to tan capsule, ovoid, acute toward tip, 3-5 (-7) mm long, 1.7-3.0 (-4) mm broad, enclosed by the fruiting calyx (or slightly exserted from it), walls thin, veiny, somewhat coreaceous, circumscissile, the upper portion dehiscing as a lid; **seeds** many, comma-shaped, dark brown to black, slightly concave on one surface, 0.5-1.0 mm broad with a curved embryo and mealy albumin; **stamens** 5, epigynous; **anthers** globose, minute; **filaments** flat, hyaline-margined, 1.0-1.5 mm long; **perianth** of a single series, greenish (reddish within), base fused into a cup for about 1/3 its length; **sepals** 5, ribbed, ca. 2 mm long, lance-ovate, cucullate, each tip with a subterminal cusp ca. 0.5 mm long, margins hyaline; **peduncle** minute or up to 1.5 mm; **flowers** solitary, subsessile (rarely in a pair); **leaves** opposite to sub-opposite, linear to obovate or broadly spatulate, obtuse tipped, entire, somewhat succulent, 3-15 (22) mm long, 1-12 mm broad, tapering gradually to the petiole; **petioles** 1-5 (-9) mm long, expanded and sheathing at base; **stipules** absent; **stems** somewhat succulent, glabrous, ribbed, much-branched, up to 40 cm long; **root system** an annual taproot with fibrous secondaries (2n = 26, 36).

Note: *Tetragonia tetragonioides* (Pall.) Kuntze, New Zealand Spinach, has been reported once as an introduction in Westchester County. This species has been extracted for chemicals called cerebrosides that are said to have ulcerogenic properties.

Cactaceae (Cactus Family)

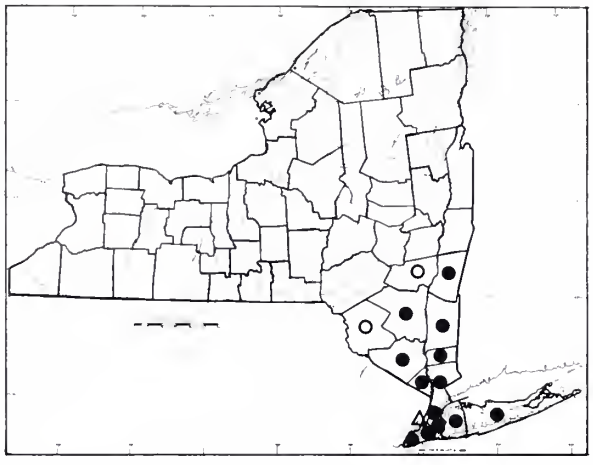
The Cactaceae: a large family to which many taxonomic interpretations have been applied. Conservative estimates of the number of taxa fall in the range of 30 genera and 800 to 1,200 species, while some authors recognize as many as 250 genera and 2,000 species. Members of the family are native from tropical areas to the temperate and austral zones of the New World. There is debate as to whether *Rhipsalis* is native to Africa and Madagascar. Cacti are best known for their stem-succulent habit and almost universal possession of spines and/or glochids. They are extremely popular in cultivation, especially among amateur enthusiasts, and many species have become endangered because of it. They are also used as food (pickles and candy), and men, birds and various animal groups often survive desiccation in arid climates by drinking their juices. Cacti serve as food and water sources for a number of living creatures, including insects, and some of the larger species provide burrows for owls and small mammals.

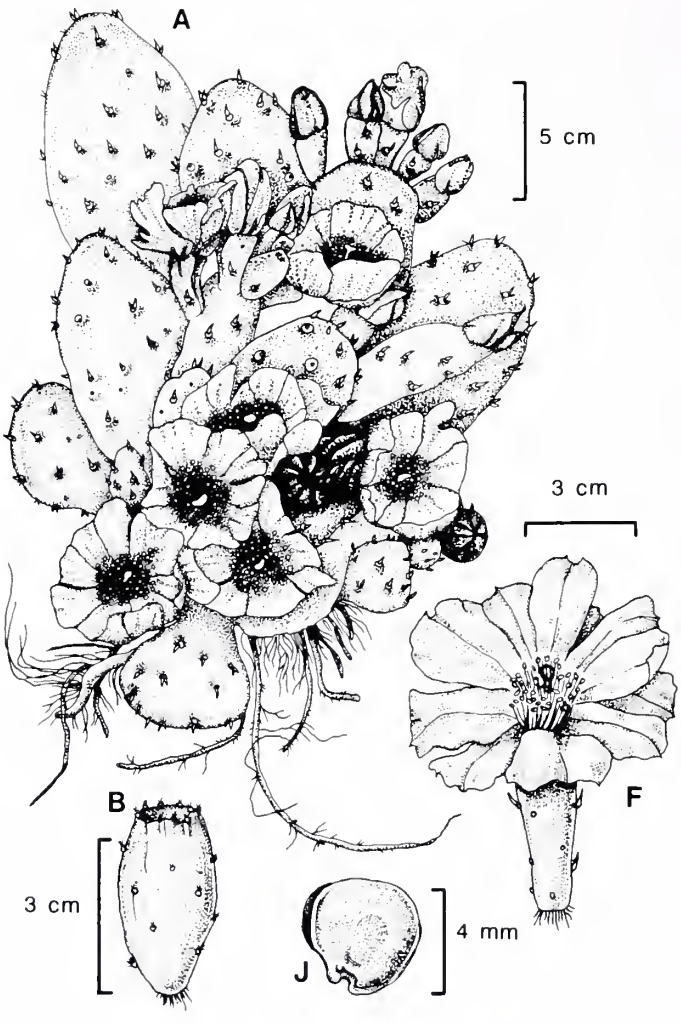
FAMILY DESCRIPTION

Succulent or woody-stemmed plants ranging from herbaceous to arborescent-columnar, the stems often jointed. Leaves are much-reduced (in most genera) or succulent, simple and alternate. Stems are usually armed with spines and pouch-like, modified buds and short-shoots (areoles) which produce hairs and/or sharp needle-like spines (glochids). Flowers are typically solitary at the areoles, or they may be borne at stem tips or in terminal cymes. They are often showy, and usually bisexual, with numerous petaloid and sepaloid tepals that often intergrade. Stamens are numerous, borne in a spiral sequence or in fascicles on the hypanthium. The gynoecium is usually compound with a multicarpellate, inferior ovary, or less often the ovary is surrounded by a perigynous hypanthial cup. Stigmas are as many as the carpels; the style is usually one. Ovules are numerous, borne on branching funiculi. Fruits are berry-like, indehiscent (rarely otherwise), tough skinned and often armed with spines, bristles or glochids. Seeds are many and lack true endosperm, but a starchy perisperm often accompanies the curved embryo.

1. OPUNTIA

Common Name: Prickly-pear
Authority: Miller, Gard. Dict. ed. 4, 1754
A genus of about 300 species, all occurring in the New World, distributed from Cape Cod and British Columbia to Tierra del Fuego. Members of this genus are very popular in cultivation, and many species have edible fruits and pads.





1. *Opuntia humifusa* (Raf.) Raf.

Common Names: Prickly-pear (Cactus), Eastern Prickly-pear, Opuntia

Type Description: Linnaeus, Species Pl. 1, p. 468, 1753

Synonyms: *Cactus opuntia* L., *C. compressus* Salisb., *O. compressa* (Salisb.) MacBr., *O. fuscoatra* Engelm., *O. rafinesquii* Engelm.

Origin: North America

Habitats: Rocky, sandy places, cliffs and creek embankments, often in full sun (in New York)

Habit: Creeping (at base), erect or spreading, perennial succulents, forming small colonies

Flowering: June-August

Fruiting: July-March

General Distribution: Massachusetts to Minnesota (and Montana), south to central Texas and south Florida

Description: Plants with bisexual flowers; **stigmas** 5-10, borne in a fleshy cluster 2-3 mm long & broad; **style** 1, linear, yellowish, 9-14 mm long; **ovary** 1, unilocular, inferior by virtue of a specialized hypanthium, smooth at first, with a few areoles, becoming a clavate-obovate **fruit**, 2.4-5.1 cm long, 1.8-4.2 cm in diameter, berry-like, broadly cylindric to obovate-obpyramidal, leathery, succulent, the umbilicus (at apex) somewhat depressed, surfaces smooth, greenish-rose to purple-brown at maturity, with occasional clusters of glochids; **seeds** disc-like, with a notch in the smooth margin, 4-5 mm broad, ca. 1.5 mm thick, greenish-tan to gray; **stamens** many; **anthers** golden, ca. 2 mm broad; **filaments** yellow, 9-11 mm long; **perianth** a spiral sequence of **tepals** ranging from yellow, obovate to strap-like **petaloid tepals** 2.5-4.3 cm long, 1.2-2.2 mm broad, with cuneate (apiculate) to obtuse tips, then grading abruptly into greenish **sepaloid tepals** with yellow, undulate margins, ovate, 0.5-2.5 cm long and broad with acute tips; **flowers** subsessile, solitary (less often paired or clustered); **areoles** ca. 3 mm broad, 1-2 (-4) cm apart on the pad, with yellow-brown **glochids** ca. 3 mm long, with minute, sharp barbs, accompanied by pale, wooly tufts; **leaves** deciduous, conical (needle-like), 4-8 mm long; **spines** (if present) 1-5 cm long, gray to brown (bleaching white), terete, stony, scarcely barbed, associated with the upper areoles of the pad; **stems** (called **pads** or **joints**) fleshy, orbiculate to elliptic-obovate, 4-10 (-12) cm long, 4.5-8.5 cm broad 0.5-1.8 cm thick, bluish to gray-green with reddish tinges shriveling to become maroon or slate gray in winter, jointed together at glochidiate nodes, the plants sometimes reaching 25 cm in height (to 40 cm further south); **root system** fleshy to fibrous, rarely tuberous (2n = 22, 44).

Infraspecific Variation: Two varieties are currently recognized in addition to *O. humifusa* var. *humifusa*, but these occur in the southeastern United States, and do not approach our range. *Opuntia humifusa* var. *ammophila* (Small) Benson is a distinctive growth form of southern savannas that has several erect, elongate pads per branch, usually bearing a number of spines along their upper margins. *Opuntia humifusa* var. *austrina* (Small) Dress, is a plant of dunes and shell-mounds with very large, ascending pads in small, dense clusters, and is the least distinctive of the three varieties.

Importance: The fruits of *Opuntia humifusa* are edible, and there is good evidence of pre-Columbian use of the plant by Native Americans as a food and water source. The spines and glochids may be removed and the pads baked, steamed or boiled for their pulp, which is sometimes used in soups. Parched seeds may be ground to a powder and used as a thickener, much like cornstarch. The plants are sometimes cultivated in rock gardens or planted as decorative borders along paths and driveways. A spineless form, also native to New York State, is the most popular cultivar.

APPENDIX I

FUNGI ASSOCIATED WITH PLANT SPECIES IN THIS TREATMENT

by J. Kenneth Dean

To be included in this list, a fungus must occur on a host species in this treatment, somewhere in the United States. Abbreviations of state names indicate literature citations only. A double asterisk (**) indicates that a NY specimen with host information has been seen. A single asterisk (*) indicates that the fungus occurs in New York State, and is known to associate (elsewhere) with a host treated here. Many literature records for *Alnus* may be based on pre-1950 species concepts. Since, in essence, there has been a reversal in the use of certain alder names in eastern North America, field identifications of *Alnus* species by mycologists must be viewed with doubt. Older literature records for *Alnus incana* may refer to *Alnus incana* subspecies *rugosa*, and records for *Alnus rugosa* may refer to *Alnus serrulata*. Some attempt has been made to minimize this confusion.

PLASMODIOPHORALES

Plasmodiophora alni (Woron.) Moeller, root tubercules on various species of *Alnus***

PERONOSPORALES

Albugo platensis (Speg.) Swing., white rust on *Mirabilis jalapa* (Tex.), on *Mirabilis nyctaginea* (Ala.)
Peronospora oxybaphi (Ellis & Kellerm.), on *Mirabilis nyctaginea* (Kans., S.D.)
Phytophthora cactorum (Leb. & Cohn) Schroet., bleeding canker
on *Betula alleghaniensis* (N.J.), *Betula pumila* (N.J.)
Phytophthora cinnamomea Rands, seedling root rot, *Betula papyrifera* (Md.), *Betula pendula* (Md.)

TAPHRINALES

Taphrina alni (Berk. & Broome) Gjaerum, on catkins of *Alnus* (Ga.)
Taphrina americana Mix, witches'-broom on *Betula alleghaniensis* (N.H., Vt.), *Betula papyrifera* (N.H., Vt., Wisc.)
Taphrina australis (Atk.) Gies., leaf blister on *Carpinus caroliniana* (Ala., Conn., Ky.)
Taphrina bacteriosperma Johans., on *Betula glandulosa* (N.H.)
Taphrina carnea Johans., red leaf blister, leaf curl on *Betula alleghaniensis*** (Maine, N.H., Vt.), *Betula glandulosa* (N.H., N.Y.), *Betula nigra* (N.H.), *Betula papyrifera* *(N.H.)
Taphrina coryli Nishida, leaf blister on *Corylus americana* (Conn., Mass., Wisc.), *Corylus avellana* (Pa.), *Corylus cornuta* (Conn., Wash.)
Taphrina flava Farl., yellow leaf blister on *Betula papyrifera* (N.H., Wisc.), on *Betula populifolia* (Maine, Mass., N.H.)
Taphrina nana Johans., on *Betula glandulosa* (Wyoming)
Taphrina populina (Fries) Fries, on *Alnus incana* subsp. *rugosa* (N.Y.)
Taphrina robinsoniana Gies., tongue-like growths on fertile catkins of *Alnus* spp. (Maine to Ga., Tex. and Minn.**)
Taphrina tosquinetii (West.) Tul. (= *Taphrina media* Palm), witches-broom on *Alnus viridis* subsp. *crispa* (N.H.)
Taphrina virginica Sadeb., leaf curl on *Ostrya virginiana* (N.H. to Fla., Tex., and Wisc.)
Taphrina sp., leaf blister on *Betula alleghaniensis* (Maine), *Betula lenta* (N.H.)

ERYSIPHALES

Erysiphe aggregata (Peck) Farl., powdery mildew on catkins of *Alnus* spp. (widespread)
Microsphaeria penicillata (Wallr.: Fr.) Lév. (= *Microsphaeria alni* DC.), powdery mildew on *Alnus incana* subsp. *rugosa* (Maine to Pa., Wisc.), on *Alnus serrulata* (Maine to Ala.,Tex.), on *Betula alleghaniensis* (Mass.), on *Betula lenta* (N.H., Ohio, Pa., W. Va.), on *Betula pumila* (Mich., Wisc.), on *Carpinus caroliniana* (Ind., Iowa, Mass., Mich., Tex., Wisc.), on *Corylus americana* (Northeastern and North Central States), on *Corylus cornuta* (Northeastern and North Central States), on *Ostrya virginiana* (N.Y. to Ohio and Wisc.)
Phyllactinia corylea Pers., powdery mildew on *Alnus incana* subsp. *rugosa* (widespread), on *Alnus serrulata* (widespread), on *Betula alleghaniensis* (Vt.), on *Betula lenta* (Mass., N.Y., Va.), on *Betula nigra* (Ill., Miss., Tex., Wisc.), on *Betula populifolia*

(N.Y.), *Carpinus caroliniana* (Ala., Ind., Ohio, Tex., Wisc.), on *Corylus americana* (Northeastern and North Central States), on *Corylus cornuta* (Northeastern and North Central States), on *Ostrya virginiana* (N.Y. to Fla., Tex. and Wisc.)

Phyllactinia guttata (Fries) Lév., *Alnus incana* subsp. *rugosa***, on *Alnus serrulata* **, on *Betula lenta* (Mass., N.Y., Va.), on *Betula nigra* (Ill., Mo., N.C., Tex., Wisc.) on *Carpinus caroliniana*** (Ala., Fla., Ind., Ohio, Texas, Wisc.), *Corylus americana* (widespread), *Corylus cornuta***(widespread), on *Ostrya virginiana* (widespread)

Uncinula macrospora Peck, powdery mildew on *Ostrya virginiana* (Mich., Wisc.)

DIAPORTHALES

Allantoporthe decedens (Fries) Barr [= *Diaporthe decedens* (Fries) Fckl.], on dead branches of *Corylus americana* (Iowa, Mich., N.Y.), on *Corylus avellana* nuts (N.Y.), on *Corylus cornuta* (Iowa, Mich., N.Y.)

Anisogramma anomala (Peck) Mueller [= *Diaporthe anomala* Peck, *Apioporthe anomala* (Peck) Höhn.], on *Corylus americanus* (N.Y.** to Iowa and Wisc.), on *Corylus avellana* (Conn., Del., Ill., Mass.), on *Corylus cornuta* (N.Y.)

Ansiogramma virgultorum (Fries) Theiss. & Syd., on branches of *Betula* sp. (N.H.)

Chapeckia nigrospora (Peck) Barr [= *Diatrype nigrospora* Peck, *Melanconis nigrospora* (Peck) Wehm.], on *Betula alleghaniensis***, on *Betula papyrifera*** (Mich.)

Cryptosporella compta (Tul.) Sacc. (= *Cryptovalsa compta* Tul.), on *Alnus incana* subsp. *rugosa***

Cryptosporella paucispora (Peck) Berl. & Vogl., on branches of *Alnus* sp.**

Diaporthe alleghaniensis R.H. Arnold, on *Betula alleghaniensis* (Mich.)

Diaporthe arctii (Lasch) Nits. [= *Diaporthe aculeata* (Schw.) Sacc.], on dead stems of *Phytolacca americana* (N.J. to Ala. and Ky.)

Diaporthe bakeri Wehm., on dead branches of *Carpinus caroliniana* (Ga., N.Y., Wisc.)

Diaporthe carpinii (Fries) Fuckel, on dead *Carpinus caroliniana***

Diaporthe eres Nits. (= *Diaporthe castaneti* Nits.), on *Alnus* sp. **, on *Ostrya virginiana* (Nebr., N.Y.)

Diaporthe pustulata (Desm.) Sacc. [= Valsaria niesslii (Wint.) Sacc.], on *Betula populifolia* **, on *Betula* sp. **

Diaporthe tessera Fuckel [= *Diatrype tessera* (Fries) Fuckel], on *Corylus* sp. **

Diaporthe tumulta (Cooke & Ellis) Sacc. (= *Diatrype tumulta* Cooke & Ellis), on *Corylus americana* (N.J.)

Diaporthella aristata (Fries) Petrack (= *Diatrype platasca* Peck), on branches of *Betula* sp.**

Ditopellopsis alni (G.E. Thomps. & J.H. Miller) Barr (= *Mamiania alni* J.H. Miller & G.E. Thompson), on fallen leaves of *Alnus serrulata* (Ga.)

Eutypa maura (Fries) Fuckel (= *Eutypa acharii* Tul.), on *Ostrya virginiana***

Gnomonia caryae Wolf, on *Carpinus caroliniana***

Gnomonia gnomon (Tode) J. Schroet., on *Alnus serrulata* (Ga.), on *Carpinus caroliniana* **, on *Corylus americana* (Ga., N.Y., Wisc.), on *Corylus cornuta*(Wash., Wisc.), on *Ostrya virginiana* (Ga., N.Y.)

Gnomonia setacea (Pers.) Ces. & De Not., on *Alnus serrulata* (Ga.), on *Betula alleghaniensis* (N.Y.), on *Betula nigra* (Ga.), on *Betula pendula* (Md.)

Gnomoniella fimbriata (Pers.) Sacc., on leaves of *Carpinus caroliniana*** (Ont.), *Ostrya virginiana* (Maine, Mass., N.Y.**)

Gnomoniella tubiformis (Tode ex Fries) Sacc., on *Alnus incana* subsp. *rugosa* (Eastern States, Wisc.), on *Alnus serrulata* (Eastern States, Ga., W.Va.), on *Alnus viridis* subsp. *crispa* (N.C.)

Mamiania fimbriatella (Pers.) Ces. & De Not.[= *Gnomoniella fimbriella* (Pers.) Sacc., on leaves of *Carpinus caroliniana* (Mich., N.Y., Vt., Wisc., W. Va.), on *Ostrya virginiana* (Maine, Mass., N.Y., Wisc.)

Mamianiella coryli (Batsch) Höhn. var. *coryli*, on *Corylus americana* and *Corylus cornuta* (midwestern to western states)

Mamianiella coryli (Batsch.) Höhn. var. *spiralis* (Peck) Barr (= *Sphaeria coryli* var. *spiralis* Peck), on *Corylus americana*** (Ill.), on *Corylus cornuta***(Mich.)

Melanconis chrysostroma (Fries) Tul., on *Carpinus caroliniana* (Ga.)

Melanconis chrysostroma (Fries) Tul. var. *ellisii* (Rehm) Wehm. (= *Diaporthe farinosa* Peck), on dead branches of *Carpinus caroliniana* (Ga., Iowa, Md., Mich., N.Y.**, Pa., S.C., Va.)

Melanconis decoralensis Ellis, on *Betula alleghaniensis* (Iowa, Mass., on *Betula nigra* (Ga., N.C.), on *Betula papyrifera* (Mass.), on *Betula pendula* (Mass.), on Betula populifolia (N.Y., Pa.)

Melanconis flavovirens (Otth) Wehm. (= *Myxosporium sulphureum* Sacc.), on dead branches of *Corylus americana* (Iowa), on *Corylus cornuta* (Iowa)

Melanconis marginalis (Peck) Wehm. [= *Diaporthe marginalis* Peck, *Melanconis alni* Tul. var. *marginalis* (Peck) Sacc.], on *Alnus viridis* subsp. *crispus* (New England States, **), on *Alnus incana* subsp. *rugosa* (Maine to N.J., Minn. and Wisc.), on *Alnus serrulata* (New England States, Miss.)

Melanconis ostryae (Dearn.) Wehm., on branches of *Ostrya virginiana* (Iowa, Mich., Nebr., N.Y.)

Melanconis platystroma Wehm., on *Carpinus caroliniana* (Mich.)

Melanconis stilbostoma (Fries) Tul., on *Betula alleghaniensis* (N.Y., Vt., W.Va.), on *Betula lenta* (Miss.), on *Betula papyrifera* (Mass. to Iowa and Wisc.), on *Betula pendula* (Mass. to Iowa and Wisc.), on *Betula populifolia* (Maine, N.Y.)

Melanconis xanthostroma (Mont.) J. Schroet [= *Cryptosporella aurea* (Fuckel) Sacc.], on *Alnus* sp.**, on *Carpinus caroliniana***

Melogramma campylosporium Fries (= *Melogramma vagans* De Not.), on *Carpinus caroliniana* (Ga.)

Melogramma patens Morg., on dead branches of *Carpinus caroliniana* (Ind., Ohio)

Ophiovalsa corylina (Tul.) Petrak (= *Cryptospora suffusa* Tul. var. *nuda* Peck in part), on *Alnus incana* subsp. *rugosa***, on *Corylus* sp.**

Plagiostoma campylostylum (Auers.) Barr var. *mirabilis* (Peck) Barr (= *Sphaeria mirabilis* Peck), on *Betula alleghaniensis***

Prosthecium acrocystis (Peck) Barr [= *Melanconis acrocystis* (Peck) Ellis & Everh., *Valsa acrocystis* Peck], on *Betula alleghaniensis* (Mich., N.J., N.Y.**, Vt.), on *Betula lenta* (Mich., N.J., N.Y.**, Vt.)

Pseudovalsa lanciformis (Fries) Ces. & De Not. [= *Melanconis ellipticia* (Peck) Peck], on twigs of *Betula papyrifera* (Ill.), on *Betula pendula* (Mass., N.Y.), *Betula populifolia***

Pseudovalsella thelebola (Fries) Höhn. [= *Melanconis thelebola* (Fries) Sacc.], on *Alnus incana* subsp. *rugosa* (N.Y., Pa.), on *Alnus serrulata* (Ga., N.Y., Pa.)

Sphaerognomonia carpinea (Fries) Potebnia [= *Laestaedia carpinea* (Fries) Sacc., *Gleosporium robergei* Desm.(conidial state)], on fallen leaves of *Alnus serrulata* (Ga.), on *Betula nigra* (Ga.), on *Carpinus caroliniana* (Ga., N.Y.**, Pa., W. Va., Wisc.), on *Ostrya virginiana* (Ga., N.J., N.Y.**, Okla., Pa., Wisc.)

Valsa ambiens Pers., on dead branches of *Betula alleghaniensis* (Mich.), on *Betula* sp. (Iowa), *Carpinus caroliniana* **, *Corylus americana* (N.Y.**), on *Corylus cornuta* (Oreg.), on *Ostrya virginiana* (Miss.)

Valsa betulina Nits., on *Betula populifolia* (Mass., N.Y.)

Valsa ceratosperma (Tode) Maire (= *Valsa ceratophora* Tul., *Valsa decorticans* Fries), on *Alnus incana* subsp. *rugosa***, on *Alnus serrulata* (S.C.), on *Betula alleghaniensis***, on *Betula nigra* (Ga.), on *Betula populifolia***, on *Carpinus caroliniana* (Ga.), on *Ostrya virginiana* (Ga.)

Valsa melanodiscus Otth (= *Valsa alni* Peck, *Valsa truncata* Cooke & Peck), on branches of *Alnus incana* subsp. *rugosa***, *Alnus* sp.**, on dead twigs of *Betula papyrifera* (N.Y.**)

Valsaria insitiva (Tode) Ces. & De Not., on *Carpinus caroliniana* (Ga.)

Valsaria quadrata Hoffm., on *Betula alleghaniensis***

Valsaria rubricosa (Fries) Fries, on dead wood of *Carpinus caroliniana* (Ga.)

Valsella laschii (Nitschke) Sacc., on *Carpinus caroliniana* (Ga.)

Winterella alnicola (Höhn.) J. Reid & C. Booth, on *Corylus* sp. (N.Y.)

Winterella aurantiaca (Wehmeyer) J. Reid & C. Booth, on *Alnus incana* subsp. *rugosa* (Mich.)

Winterella betulae (Tul. & C. Tul.) Kuntze [= *Ophiovalsa tomentella* (Peck) Petrak, *Valsa tomentella* Peck, *Cryptospora tomentella* (Peck) Berl. & Vogl., *Cryptospora betulae* Tul.], on dead on *Betula lenta* (N.J., N.Y.), on *Betula nigra* (Ga.), on *Betula papyrifera* (Mass., **), on *Betula populifolia* (N.Y.**), on *Betula* sp. (Mass., Mich., N.J., Vt.)

Winterella femoralis (Peck) Kuntze [= *Cryptospora femoralis* (Peck) Sacc., *Ophiovalsa femoralis* (Peck) Petrak, *Valsa femoralis* Peck, *Cryptospora humeralis* Dearn. & House,], on *Alnus incana* subsp. *rugosa* (N.J., N.Y.**, W. Va.), on *Alnus serrulata* (Ga., N.J., N.Y.**, W.Va.), on *Betula lenta* (N.Y.)

Winterella suffusa (Fr.) Kuntze, [= *Cryptospora alnicola* Höhn., = *Cryptospora suffusa* (Fries) Tul.var. *nuda* Peck, in part, *Cryptospora suffusa* (Fries) Tul.], on *Alnus incana* subsp. *rugosa***, on *Alnus serrulata***

CORONOPHORALES

Bertia moriformis (Tode) DeNot, on *Alnus incana* subsp. *rugosa***, on *Betula alleghaniensis* (N.C.)

Coronophora annexa (Nitschke) Fuckel, on *Betula nigra* (Ga.)

Coronophora sp., on dead branches of *Carpinus caroliniana* (**, Tex.)

SORDARIALES

Coniochaeta lignaria (Grev.) Cooke, on *Ostrya virginiana* (Ind.)

Coniochaeta sp., on Betula alleghaniensis (Mich.)

Lasiosphaeria chrysentera Carroll & Munk, on leaves of *Alnus incana* (Idaho)

Nitschkia callista (Berk. & Curtis) Nannf.[= *Cryptosphaerella callista* (Berk. & Curtis) Fitz.], on *Carpinus caroliniana*** (eastern United States)

Nitschkia confertula (Schw.) Nannf., on *Carpinus caroliniana* (Ga.)

CALOSPHAERIALES

Calosphaeria ciliatula (Fries) Karst, on *Betula populifolia***
Calosphaeria microsperma Ellis & Everh., on *Carpinus caroliniana* (Mass., N.Y.**)
Enchnoa subcorticalis (Peck) Barr (= *Sphaeria subcorticalis* Peck), on *Carpinus caroliniana* (Mass., N.Y.**)
Graphostroma platystoma (Schw.) Pirozynski, on *Carpinus caroliniana* (Ga.), on *Ostrya virginiana* (Ala.)

LEOTIALES (HELOTIALES)

Arachnopeziza cornuta (Ellis) Korf, on wood of *Betula alleghaniensis* **
Bisporella citrina (Batsch.) Korf & Carp. [= *Helotium citrinum* (Batsch.) Fries], on decayed log of *Betula* sp.**
Calycellina populina (Fuckel) Höhn., on fallen leaves of *Betula* sp. (N.H.)
Cenangium compressum Schw., on *Carpinus caroliniana***
Cenangium coryli Corda, on *Corylus americana***
Cenangium rubigenellum Sacc., on dead *Carpinus caroliniana***, *Ostrya virginiana***
Chlorociboria aeruginosa (Pers.) Seaver ex Ramamurthi, Korf & Batra [= *Chlorosplenium aeruginosa* (Pers.) Auct.], green stain on dead wood of *Alnus rugosa* **, on trees in the yellow birch group**,and *Carpinus caroliniana*** (cosmopolitan)
Ciboria betulae (Wor.) White, on fallen aments of *Betula nigra* (Md.)
Dasyscyphella dryinus (Karst.) Raitviir, on *Alnus incana* (Wash.)
Dermea cerasii (Fries) Fries (= *Cenangium cerasii* Fries), on *Betula alleghaniensis***
Dermea molliuscula (Schw.) Cash, on dead twigs of *Betula alleghaniensis* (Northeastern States, Mich., N.C.), *Betula lenta* (N.H. to Va. and Mich.), *Betula populifolia***
Discohainesia oenotherae (Cooke & Ellis) Nannf., on fallen leaves of *Betula nigra* (N.C.)
Durandiella seriata (Fries) Groves, on *Betula alleghaniensis* (N.J., N.Y., Pa.),on log of *Betula lenta*** (the perfect state of *Gelatinosporium betulinum* Peck)
Godronia seriata (Fries Seaver [= *Scleroderris seriata* (Fries) Rehm], on dead branches of *Betula alleghaniensis* (N.J., N.Y.**, Pa.)
Encoelia furfuracea (Roth.) Karst. [= *Cenangium furfuraceum* (Roth) De Not.], on twigs of *Alnus incana* subsp. *rugosa* (Maine, Mich., N.Y.), on *Alnus serrulata* (Maine, N.Y.**), on *Corylus americana* (N.D.)
Hamatocanthoscypha sp., on inner bark of *Betula alleghaniensis* **
Helotium epiphyllum (Pers.) Rehm ex Kauffm., on dead leaves of *Betula* sp.**
Hyaloscypha vitreolum (Karst.) Karst, on wood of *Betula alleghaniensis* **
Hymenoscyphus calyculus (Sowerby) W. Phillips, on twigs of *Alnus incana* (Wash.)
Hymenoscyphus caudatus (Karst.) Dennis, on dead leaves of *Alnus* sp.**
Hymenoscyphus fastidiousus (Peck) Arndholz, on dead leaves of *Alnus* sp.**
Incrucipulum sulphurellum (Peck) Baral & Krieglsteiner (= *Dasyscyphus sulphurellus* (Peck) Sacc.), on *Betula lenta* (N.C.)
Lachnum virgineum (Batsch: Fr.) Karst., on twigs of *Alnus serrulata* (Ga.)
Mollisia cinerea (Batsch.) Karst., on rotten log of *Betula* sp.**
Mollisia ligni (Desm.) Karst., on *Betula alleghaniensis* wood**
Mollisia sp., on *Betula alleghaniensis* **
Neobulgaria pura (Fries) Petrak, on log of *Betula alleghaniensis***
Orbilia auricolor (Blox.& Berk.) Sacc., on inner bark of *Betula alleghaniensis* **
Orbilia curvatispora Boud., on wood of *Betula alleghaniensis* **
Pezicula alni Rehm, on dead branches of *Alnus incana* subsp. *rugosa* (Mich., Minn.), *Alnus serrulata* (Fla., N.C.)
Pezicula alnicola Groves, on *Alnus* sp.**
Pezicula carpinea (Pers.) Tul., branch and trunk canker on *Carpinus caroliniana* (Mass. to Ga. and Okla.)
Pezicula corylina Groves, on twigs of *Corylus avellana* (Pa.), on *Corylus cornuta* (N.H., N.Y.**) *Sphaeronaema coryli* Peck is an anamorph
Phaeangium magnisporum Cash & J.A. Stevenson, on *Betula nigra* (Ga.)
Phaeohelotium subcarneum (Schum.) Dennis, on inner bark of *Betula alleghaniensis* **
Proliferodiscus alboviridis (Lib.) Dennis, on *Alnus incana* subsp. *rugosa* (N.H.)
Rhizodiscina lignyota (Fries) Hafellner [= *Karschia lignyota* (Fries) Sacc., on dead branches of *Alnus incana* subsp. *rugosa* **, on *Betula* sp. (Mass.)
Rutstroemia bolaris Batsch.) Rehm, on twigs of *Carpinus caroliniana* (N.Y.)

Spathulariopsis velutipes (Cooke & Farlow) Maas G., on *Betula* sp. (Mich.)
Tapesia fusca (Pers.) Fuckel, on *Betula alleghaniensis* (N.C.), on *Betula lenta* (N.C.)
Triblidium cucurbitaria Rehm, on bark of living *Ostrya virginiana***
Tympanis alnea (Pers.) Fries, on dead branches of *Alnus incana* subsp. *rugosa* (N.Y.**, Pa.)

OSTROPALES

Acrospermum compressum Tode: Fries, on *Alnus serrulata* (Ga.), on *Betula nigra* (Ga.)
Acrospermum foliicola Berk., on *Ostrya virginiana* (Ga.)

PEZIZALES

Lamprospora crec'hqueraultii (H. Crouan) Boud., on log of *Betula papyrifera* (Mich.)
Peziza repanda Pers., on *Betula papyrifera* (Mich.)
Scutellinia hirta (Schumach.) Kuntze, on *Alnus incana* (Idaho)
Scutellinia scutellata (L.) Lambotte, on *Betula alleghaniensis* (N.Y., N.C.)
Urnula craterium (Schw.) Fries, on *Carpinus caroliniana* (N.C.)

XYLARIALES

Camarops microspora (Karst.) Shear (= *Valsa exudans* Peck), on bark of *Alnus incana* subsp. *rugosa***
Daldinia concentrica (Bolt.) Ces. & DeN. [= *Daldinia loculata* (Lév.) Sacc.], wood rot on *Alnus incana* subsp. *rugosa* (Maine, Mich., N.H.), on *Alnus serrulata* (Maine, Mich., N.H.), on *Betula alleghaniensis (widespread),* on *Betula lenta* (Minn., N.C.), on Betula nigra (Ga., N.C.), on *Betula papyrifera* (Maine, Vt.), on *Betula populifolia* (Conn.), on *Carpinus caroliniana* (Md.), on *Ostrya virginiana*** (Ga.)
Daldinia vernicosa (Schw.) Ces. & DeNot., on *Alnus incana* (Idaho), on *Betula* sp. (N.Y.)
Diatrype albopruinosa (Schw.) Cooke., on *Betula papyrifera* (Iowa), on *Carpinus caroliniana* (Iowa), on *Ostrya virginiana* (Iowa, Miss., N.D.)
Diatrype americana Ellis & Everh. forma *ostryae* Rehm., on *Ostrya virginiana* (N.D.)
Diatrype bullata (Hoffm.: Fries) Fries, on *Alnus incana* (Idaho), on *Carpinus caroliniana***, on *Corylus americana***
Diatrype disciformis (Hoffm.: Fries) Fries, on *Alnus incana* subsp. *rugosa***, on *Betula alleghaniensis* (N.C.), on *Carpinus caroliniana***
Diatrype duriaei Mont., on *Carpinus caroliniana***, on *Corylus americana***, on *Corylus rostrata***, on *Ostrya virginiana***
Diatrype platystoma (Schw.) Curtis, on *Ostrya virginiana* (Ala.)
Diatrype stigma Hoffm.: Fries, on *Alnus incana* (Minn.), on *Betula alleghaniensis* (Ga.**), on *Betula lenta* (N.C., S.C.), on *Betula papyrifera* (Iowa, Idaho, Maine, Mass., Vt., Wash.), on *Carpinus caroliniana* (Iowa), on *Corylus cornuta***, on *Ostrya virginiana* (Iowa, N.Y.)
Diatrype undulata (Pers.) Fries, on *Betula* sp. (N.J.)
Diatrypella betulina (Peck) Sacc., on dead branches of *Betula alleghaniensis* (Ga., N.Y.**, W. Va., Wisc.), on *Betula lenta* (N.Y.**, W. Va., Wisc.), on *Betula papyrifera* (Idaho, Maine, Mich., Minn., N.Y.**), on *Betula populifolia* (Maine)
Diatrypella decorata Nits. (= *Diatrype discoidea* Peck, *Valsella adherens* Fuckel var. *americana* Peck), on *Alnus serrulata* (S.C.), on *Betula alleghaniensis* (Ga., Miss., N.Y.**, W. Va.), on *Betula lenta* (Ga., Miss., N.Y., W. Va.), on *Betula populifolia* (N.Y.**), on *Carpinus caroliniana* (Ga., N.Y.)
Diatrypella eutypaeformis (Sacc.) L.C. Tiffany & Gilman, on *Carpinus caroliniana* (Iowa)
Diatrypella favacea (Fries) Nits., on *Alnus incana* subsp. *rugosa* (Minn.), on *Alnus serrulata* (Ga.), on *Betula alleghaniensis* (Pa.), on *Betula nigra* (Ga.,Ky.), on *Betula papyrifera* (Iowa, Minn.), on *Betula populifolia* (N.Y.), on *Corylus americana* (Iowa)
Diatrypella frostii Peck, on dead branches of *Corylus americana* (N.D.)
Diatrypella minutispora Dearn., on *Corylus cornuta* (N.Y.)
Diatrypella missouriensis Ellis & Everh., on *Corylus americana* (Mo., N.Y.**)
Diatrypella nigro-annulata (Grev.) Nits., on *Alnus* sp.**
Diatrypella nitschkei (Fuckel) L.C. Tiffany & Gilman, on *Carpinus caroliniana* (Fla.)
Diatrypella placenta Rehm, on dead limbs of *Alnus incana* (Mont., Oregon), on dead limbs on *Alnus serrulata* (Ga., N.C.)
Diatrypella verrucaeformis (Ehrh.) Nits., On *Alnus incana***, on *Betula* sp. (Ont.), on *Corylus* sp.**
Endoxylina moroides (Cooke & Peck) Shoemaker & Egger (= *Diatrye moroides* Peck), on branches of *Alnus incana* subsp. *rugosa***

Eutypella angulosa (Nits.) Sacc., on trunks and branches of *Betula alleghaniensis***, *Betula nigra* (Mo.), *Betula papyrifera*** (Minn., S.D.), *Betula populifolia* (N.Y.**)
Eutypella cerviculata (Fries) Sacc., on fertile catkins of *Alnus* spp. (widespread**), on *Betula alleghaniensis***, on *Betula papyrifera* (S.D.), on *Carpinus caroliniana* (Iowa, Mich., Miss., N.Y.), on *Ostrya virginiana* (Iowa)
Eutypella glandulosa (Cooke) Ellis & Everh., on *Alnus* sp. (Ga., Tenn.)
Eutypella leprosa (Pers.) Berl, on *Betula papyrifera* (Iowa)
Eutypella microcarpa Ellis & Everh., on *Carpinus caroliniana* (Ga.)
Eutypella scoparia (Schw.) Ellis & Everh., on *Betula papyrifera* (Iowa), on *Carpinus caroliniana* (Ga., N.C.)
Eutypella stellulata (Fries) Sacc., on *Alnus incana* subsp. *rugosa***, *Alnus serrulata* (N.C., **), on *Betula lenta***, on *Carpinus caroliniana***, on *Corylus americana***
Eutypella tetraploa (Berk. & Curtis) Sacc., on *Corylus cornuta* (Wash.)
Hypoxylon albocinctum Ellis & Everh., on *Ostrya virginiana* (Iowa)
Hypoxylon atropunctatum (Schw.) Cooke, on *Ostrya virginiana* (Ga.) *Hypoxylon cohaerens* (Pers.) Fries, on *Corylus cornuta* Oreg.)
Hypoxylon fragiforme (Pers.:Fries) Kickx (= *Hypoxylon coccineum* Bull.), on *Betula populifolia* **
Hypoxylon fuscum Pers., on *Alnus* spp. (** widespread), on *Betula alleghaniensis*** on *Betula nigra* (Ga.), on *Carpinus caroliniana* (Mo.), on *Corylus americana* (Mich.**), on *Ostrya virginiana* (Ala., Ind.)
Hypoxylon fuscopurpureum (Schw.) Berk., on *Alnus incana* subsp. *rugosa***, on *Ostrya virginiana* (Ont.)
Hypoxylon fuscum (Pers.: Fr.) Fr., on *Alnus incana* (Idaho, Mont., Wash.), on *Alnus serrulata* (Ga., N.C.), on *Corylus americana* (Mich.), on *Corylus cornuta* (Oreg.)
Hypoxylon howeianum Peck, on *Betula lenta*** (Ga.), on *Betula nigra* (Ga.), on *Ostrya virginiana* (N.Y.**)
Hypoxylon hypophlaeum (Berk. & Rav.) J.H. Miller, on *Alnus serrulata* (Ga.), on *Carpinus caroliniana* (Ga.), on *Ostrya virginiana* (Ga.)
Hypoxylon marginatum (Schw.) Berk., on *Ostrya virginiana* (Ala.)
Hypoxylon morsei Berk. & Curtis, on *Alnus incana* subsp. *rugosa* (Maine, N.D.,N.Y.**), on *Carpinus caroliniana* (Iowa)
Hypoxylon multiforme Fries(= *Hypoxylon granulosum* Bull.), on *Alnus* sp.**, on *Betula alleghaniensis***, on *Betula papyrifera* (Maine to Minn.**), on *Betula populifolia***
Hypoxylon papillatum Ellis & Everh., on *Betula nigra* (Ga.)
Hypoxylon perforatum Schw., on *Carpinus caroliniana* (Ind.), on *Ostrya virginiana* (Ind.)
Hypoxylon pruinatum (Klotzsch) Cooke, on *Alnus incana* subsp. *rugosa***, on *Betula alleghaniensis* (Mich., Minn.)
Hypoxylon rubiginosum Pers., on *Alnus serrulata* (Ga., N.C.), on *Betula lenta* (N.C.), on *Betula nigra* (Ga.), on *Carpinus caroliniana* (widespread), on *Corylus cornuta* (Wash.), on *Ostrya virginiana* (Ga.)
Hypoxylon tinctor (Berk.) Cooke, on *Carpinus caroliniana* (Ga.)
Hypoxylon transversum (Schw.), on *Betula alleghaniensis***
Hypoxylon truncatum (Schw.) J.H. Miller, on *Betula nigra* (Ga.) on *Ostrya virginiana* (Ala)
Hypoxylon xanthocreas Berk. & Curtis (= *Hypoxylon peckianum* Sacc.), on *Alnus* sp. **
Lopadostoma gastrinum (Fries) Traverso, on *Betula* sp. (Mass.)
Monographella nivalis (Schaffnit) E. Mueller, on *Opuntia humifusa* (Fla., N.Y.)
Rosellinia aquila (Fries) De Not., on *Carpinus caroliniana* (Ga.), on *Ostrya virginiana* (Iowa, Ind.)
Rosellinia desmazieresii (Berk. & Broome) Sacc., on *Betula lenta* (N.C.)
Rosellinia ligniaria (Grev.) Nits., on *Ostrya virginiana* (Ind.)
Rosellinia pulveracea (Ehr.) Fckl., on *Carpinus caroliniana* (Va.)
Xylaria castorea Berk., on *Betula alleghaniensis***
Xylaria corniformis (Fries) Fries, on *Carpinus caroliniana* (Ga.)

PHYLLACHORALES

Glomerella cingulata (Stoneman) Spauld. & H. Schrenk, on *Betula pendula* (Va.)

PHACIDIALES

Cocomyces coronatus (Schw.) DeNot., on fallen *Betula* leaves (Maine, N.H.)
Phacidium fraxineum Schw., on *Betula populifolia***
Propolis faginea Karst., on *Ostrya virginiana***
Propolomyces versicolor (Fries) Dennis, on *Alnus serrulata* (Ga.), on *Betula lenta* (N.C.)

HYPOCREALES

Gibberella baccata (Wallr.) Sacc., on twigs of *Carpinus caroliniana* (Ala.)
Hypocrea gelatinosa (Tode) Fries, on *Betula* sp. (N.Y.)
Hypocrea schweinitzii (Fries) Sacc., on *Betula nigra* (Ga.)
Hyponectria betulina Barr, on overwintered leaves of *Betula* sp. (Maine, Mass.)
Nectria cinnabarina Tode, on twigs of *Betula alleghaniensis* (Maine to Ga. and Mich.**), on *Betula lenta* (Maine to Ga. and Mich.), on *Betula nigra* (Maine to Ga. and Mich.), on *Betula papyrifera* (Minn.)
Nectria coccinea Pers., on branches of *Alnus incana* subsp. *rugosa* (N.Y., Pa.), on *Betula alleghaniensis* (Conn., Mass., Mich., N.Y.), on *Betula lenta* (Conn., Mass., Mich., N.Y.), on *Betula papyrifera* (N.Y.), on *Betula populifolia* (N.Y.)
Nectria coryli Fckl. on dead branches of *Betula alleghaniensis* (N.C.) of *Corylus cornuta* (N.J., N.Y.)
Nectria discophora (Mont.) Mont. (= *Nectria mammoidea* Phill. & Plowr.), on dead branches of *Betula alleghaniensis* (Vt.)
Nectria episphaeria (Tode: Fr.) Fr., on *Alnus incana* (Idaho)
Nectria galligena Bres., on *Alnus incana* subsp. *rugosa* (N.H.), on *Betula alleghaniensis* (Conn., N.Y., Pa.), on *Betula lenta* (Conn., Mass., N.Y., Pa.), on *Betula nigra* (Conn., N.Y., Pa.), on *Betula papyrifera* (Maine to Pa., and Mich.), on *Betula pendula* (Pa.), on *Betula populifolia* (Conn., Mass., N.H., N.Y.), on *Carpinus caroliniana* (Conn., N.Y.)
Nectria peziza (Tode) Fr., on *Betula* sp. (Minn., N.Y.)
Nectria sp., on *Ostrya virginiana* (N.Y.)
Ophiodothis alnea (Pers.) Ellis & Everh.?, on *Alnus incana* subsp. *rugosa* (N.H.),on *Alnus serrulata* (Pa.)

MYRIANGIALES

Arthothelium lichenalis (Peck) Barr (= *Sphaeria lichenalis* Peck), on *Betula* sp. (Vt.)

DOTHIDEALES

Atopospora betulina (Fries) Petr. [= *Euryachora betulina* (Fries) Schroet.], black-speckled leaf spot on *Betula glandulosa* (Ark., Maine), on *Betula pumila* (Minn., Wisc., N.Y.)
Botryosphaeria dothidea (Moug.) Ces. & De Not., on *Betula nigra* (Ga.), on *Betula pendula* (Ill.), on *Ostrya virginiana* (Ga.)
Botryosphaeria obtusa (Schw.) Shoemaker [=*Physalospora obtusa* (Schw.) Cooke], on *Alnus serrulata* (S.C., Va.), on *Betula nigra* (Ga.), on *Carpinus caroliniana* (widespread), on *Corylus americana* (N.J.), on *Corylus avellana* (Calif.), on *Opuntia humifusa* (N.Y.), on *Ostrya virginiana* (Ga., N.Y.)
Botryosphaeria rhodina (Cooke) Arx, on *Opuntia humifusa* (Fla.)
Botryosphaeria ribis (Tode) Gross. & Dug., on seedlings of *Alnus glutinosa* (Fla.), on *Ostrya virginiana* (Ga.)
Cucurbitaria conglobata (Fries) Ces. & De Not., on dead branches of *Corylus americana* (N.Y., Pa.), on *Corylus cornuta* (N.Y., Pa.)
Cucurbitaria conglobata Ellis & Everh., on *Alnus serrulata* (Ga.)
Dichaena strumosa Fries, on *Betula populifolia***
Diplotheca tunae (Spreng.) Starb., on *Opuntia humifusa* (Fla., Wisc.)
Didymosphaeria sp., on *Betula nigra* (Ga.)
Dothidea pucciniodes Fr., on *Alnus serrulata* (Ga.)
Eudimeriolum septentrionale M.L. Farr & Luttrell, on *Betula nigra* (Ga.)
Glonium stellatum Mühlenberg, on decorticated wood of *Betula lenta* (N.C.)
Herpotrichiella pilosella (Karst.) Munk, on dead wood of *Betula* sp. (N.H.)
Hysterium angustatum Albertini & Schw., on *Betula* sp. (Minn.)
Hysterium pulicare Fries, on *Betula alleghaniensis***, on *Betula nigra* (Ga., N.C.))
Lembrosia cactorum Tracey & Earle, on *Opuntia humifusa* (Fla.)
Mycosphaerella alnicola (Peck) Jaap, on fallen leaves of *Alnus viridis* subsp. *crispa* (N.Y.**)
Mycosphaerella borealis (Bubak & Vleugel) Barr, on *Alnus* sp.(N.H., Vt.)
Mycosphaerella hartlensis (Auersw.) P. Larsen [= *Mycosphaerella perparva* (Sacc.) House], on *Alnus incana* subsp. *rugosa* (N.Y.)
Mycosphaerella opuntiae (Ellis & Everh.) Dearn., black rot of *Opuntia humifusa* (Fla., N.Y.)
Mycosphaerella punctiformis Marsh., on *Betula populifolia***, on *Ostrya virginiana* (Ga.)
Ostreichnion curtisii (Duby) Barr, on *Carpinus caroliniana* (Ga.)
Physalospora abdita (Berk. & Curtis) N. E. Stevens, on branches of *Alnus serrulata* (N.C.)
Physalospora rhodina (Berk. & Curtis) Cooke, on *Opuntia humifusa* (Fla.)

Platychora alni (Peck) Petrak (= *Dothidella alni* Peck), on *Alnus viridis* subsp. *crispa* (N.Y.**)
Pleomassaria carpini (Fuckel) Sacc., on *Carpinus caroliniana* (Ga., N.Y.**)
Pleomassaria monosperma (Peck) Barr [= *Sphaeria monosperma* Peck, *Julella monosperma* (Peck) Sacc.], on decorticated wood of *Betula* sp. **
Pleomassaria siparia (Berk. & Br.) Sacc. (= *Prosthemium betulinum* Kunze), on limbs of *Betula* sp.(Maine), on twigs of *Betula pendula* (Mass.)
Scorias spongiosa (Schw.) Fries, sooty mold on leaves and twigs after insect infestation, on *Alnus incana* subsp. *rugosa* (N.Y.**), on *Alnus serrulata* (Ga., N.C., W.V.), on *Corylus americana* (Md.)
Splanchnonema argus (Berk. & Br.) O. Kuntze [= *Massaria argus* (Berk. & Br.) Tul.], on branches of *Betula lenta* (Ga.), *Betula nigra* (Ga.), *Betula* sp.** (Mass., Pa.)
Splanchnonema pupula (Fries) Kuntze, on *corylus cornuta* (Oreg.)
Splanchnonema scoriadem (Fries) Barr, on *Betula nigra* (Mass., N.C.), on *Betula populifolia* (Mass.), on *Betula* sp.**
Thyridium antiquum (Ellis & Everh.) Sacc., on *Carpinus caroliniana***
Venturia alnea (Fries) Mueller (= *Sphaerella minutissima* Peck), on *Alnus incana* subsp. *rugosa***
Venturia ditricha (Fries) Karst. (= *Fusicladium betulae* Aderh., *Venturia maculans* Peck), on fallen leaves of *Betula populifolia* (Maine, N.Y.**)

MELANOMMATALES

Byssosphaeria alnea (Peck) Barr [= *Gibberidea alnea* (Peck) Wehm., *Massarina alnea* (Peck) Holm], on twigs of *Alnus* sp. (N.Y.**)
Fenestella princeps Tul. (= *Fenestella macrospora* Fuckel), on *Alnus incana* subsp. *rugosa***, *Corylus americana***
Lophiostoma quadrinucleatum Karst. var. *triseptatum* (Peck) Chesters & Bell, on *Ostrya virginiana* (Ont.)
Massaria lantanae (G. Otth) Shoemaker & P.M. Leclair (= *Massaria plumigera* Ellis & Everh.), on *Corylus americana* (Ont.)
Melanomma pulvis-pyris (Pers.) Fuckel, on *Betula alleghaniensis* (N.C.), on *Ostrya virginiana***
Pseudotrichia mutabilis (Pers.) Wehm. (= *Lasiosphaeria viridicoma* (Cooke & Peck) Sacc.), on bark of *Betula* sp. (Ont.)

HEMISPHAERIALES (MICROTHYRIALES)

Lembosia cactorum Tracey & Earle, black mildew on *Opuntia humifusa* (Fla.)

UREDINALES

Melampsoridium betulinum (Pers.) Kleb., II, III on *Betula alleghaniensis* (Ind., Maine, N.H., Vt.), on *Betula glandulosa* (Ark., Idaho, Mont., Wash.), on *Betula pumila* (Mass., Mich., Minn., Wisc.), on *Betula papyrifera* (Conn., Ill., Maine, Mich., Minn., N.H.), on *Betula populifolia* (Northeastern States**), on *Ostrya virginiana* (N.Y.). 0, I on *Larix laricina*
Melampsoridium carpinii (Nees) Diet., II, III on *Ostrya virginiana* (N.Y.). 0, I unknown

AURICULARIALES

Auricularia auricula (L.) Underw., on *Betula alleghaniensis* (N.C.), on *Betula lenta* (N.C.)
Helicogloea terminalis Olive, on limbs of *Betula* sp. (N.C.)

TREMELLALES

Exidia candida C.G. Lloyd, on *Corylus cornuta* (Wash.)
Exidia glandulosa Fr., on *Betula lenta* (N.C.)
Exidia recisa Fr., on *Betula nigra* (Ga.)
Exidia repanda Fries, on *Alnus incana* (Idaho)
Sebacina helvelloides (Schw.) Burt, at the base of living *Ostrya virginiana* Trees (Iowa)
Sebacina incrustans (Pers.) Tul., on *Corylus americana* (Wash.)
Tremella mesenterica Retz., on *Corylus cornuta* (Wash.)

DACRYMYCETALES

Arrhytidia involuta (Schw.) Coker, on wood of *Betula nigra* (N.H.)
Dacrymyces minor Peck, on *Ostrya virginiana* (Iowa)

TULASNELLALES

Tulasnella bifrons Bourd. & Galzin, on *Betula* sp. (Mass.)
Tulasnella eichleriana Bres., on wood of *Betula* sp. (Pa.)
Tulasnella pinicola Bres., on wood of *Betula nigra* (Ga.)
Tulasnella pruinosa Bourd. & Galzin, on bark of *Betula nigra* (Ga.), on *Carpinus caroliniana* (N.Y.)

APHYLLOPHORALES

Aleurobotrys botryosus (Burt) Boidin, Lanquetin, Gilles, Candoussau, & Hughueney, on *Ostrya virginiana* (Conn.)
Aleurodiscus griseo-canus (Bres.) Höhn. & Litsch., on *Ostrya virginiana* (Iowa, Mo.)
Aleurodiscus oakesii (Berk. & Curtis) Cooke, on *Betula allegeniensis* (Vt.), on *Carpinus caroliniana* (N.Y.), on *Ostrya virginiana* (widespread) *Aleurodiscus strumosus* (Fries) Burt, on *Ostrya virginiana* (Fla.)
Amphinema byssoides (Pers.) J. Eriksson, on *Betula papyrifera* (Minn.)
Antrodiella semisupina (Berk. & Curtis) Ryvarden, on *Alnus incana* (Mont.), *Betula* sp. (N.Y.)
Asterodon ferruginosum Pat., on log of *Betula* sp. (Mich.)
Basidioradulum radula (Fr.) Nobles, on *Alnus incana* (Wash.)
Bjerkandera adusta (Willd.) Karst. [= *Polyporus adustus* Willd., *Gloeosporus adustus* (Willd.) Pilát], wood rot of *Alnus* spp., on *Betula* spp. *Carpininus caroliniana*, *Ostrya virginiana* (widespread)
Cellypha subgelatinosa (Berk. & Curtis) Rehm, on *Alnus serrulata* (S.C.)
Ceraceomyces borealis (Romell) J. Eriksson & Ryvarden, on *Betula alleghaniensis* (N.Y.
Cerocorticium cremoricolor (Berk. & Curtis) Ginns, on *Corylus americana* (N.D.)
Cerrena unicolor (Bull.: Fr.) Murr. (= *Daedalea unicolor* Bull.), on *Alnus incana* subsp. *rugosa* (Maine, Va.), on *Alnus serrulata* (Maine, Va.), on *Betula alleghaniensis* (Northeastern States), on *Betula glandulosa* (Idaho), on *Betula nigra* (N.C.) on *Betula papyrifera* (Northeastern and Great Lake States), on *Betula populifolia* (Maine), on *Ostrya virginiana* (Vt.)
Chondrostereum purpureum (Pers.) Pouzar (= *Stereum purpureum* Pers., on *Alnus rugoa* (Maine, Vt.), on *Betula alleghaniensis* (N.H., N.Y., Vt.), on *Betula papyrifera* (widespread), on *Betula populifolia* (Conn., Mass.), on *Carpinus caroliniana* (Conn., Del.), on *Ostrya virginiana* (N.Y.)
Clavicornea pyxidata (Pers.) Doty (= *Clavaria pyxidata* Pers.), on *Betula alleghaniensis* (Mich.), on *Betula* sp. (Conn., N.C.)
Climacodon pulcherrimus (Berk. & Curtis) Nikolaeva [=*Steccherinum pulcherrimum* (Berk. & Curtis) Banker, on *Betula nigra* (Ind.)
Coniophora arrida (Fries) Karst., on *Betula populifolia* (N.Y.)
Coniophora puteana (Schum.) Karst., on *Alnus incana* (Idaho), on dead wood of *Betula* spp.(widespread)
Cystostereum murrayi (Berk. & Curtis) Pouzar [= *Stereum murrayi* (Berk.& Curtis) Burt, on *Betula alleghaniensis* (Maine to Tenn. and Minn.), on *Betula lenta* (Eastern States, Minn.), on *Betula nigra* (Eastern States), on *Betula papyrifera* (Idaho, Maine, Minn., N.Y., Ore., Pa.), on *Carpinus caroliniana* (Va.), on *Ostrya virginiana* (Minn., Pa.)
Cytidia patelliformis (Burt) A.L. Weldon, on *corylus cornuta* (Wash.)
Dacryobolus karstenii (Bres.) Oberwinkler, on *corylus cornuta* (Wash.)
Daedalea quercina L., heart rot, on *Betula allegeniensis* (Conn.)
Daedaleopsis confragosa (Bolt.) J. Schroet., (= *Daedalea confragosa* Bolt., on *Alnus incana* subsp. *rugosa* (Ind.), *Betula papyrifera* (Mich., Vt.), on trees in the Yellow Birch group (Maine to N.C., Tenn., Wisc.), on *Carpinus caroliniana* (N.C.), on *Ostrya virginiana* (Vt.)
Datronia mollis Sommerf.) Donk [= *Trametes mollis* (Sommerf.) Fries], on *Betula papyrifera* (Minn.), on *Carpinus caroliniana* (Fla.), on *Corylus* spp. (rare), on *Ostrya virginiana* (N.Y., Vt.)
Datronia scutellata (Schw.) Gilbertson & Ryvarden [= *Fomes scutellatus* (Schw.) Cooke], wood rot in *Alnus incana* subsp. *rugosa* (Maine to Mich.), in *Alnus serrulata* (Maine to Ala.)
Datronia stereoides (Fries) Ryvarden (= *Polyporus stereoides* Fries), on *Betula papyrifera* (Minn.)
Dendrocorticium roseocarneum (Schw.) M. Larsen & Gilbertson, on *Alnus incana* subsp. *rugosa* (Vt.)
Dendrophora albobadia (Schw.) Chamuris, on wood of *Carpinus caroliniana* (Ga.), on *Ostrya virginiana* (Ga.)
Dendrophora erumpens (Burt) Chamuris, on *Betula papyrifera* (S.D.), on *Carpinus caroliniana* (Ind.)

Dendropliora versiformis (Berk. & Curtis) Chamuris (= *Stereum versiforme* Berk.& Curtis), on *Betula alleghaniensis* (N.Y., Va.), on *Betula lenta* (widespread), on *Carpinus caroliniana* (Conn.)
Dendrothele griseo-cana (Bres.) Bourd. & Galzin, on *Ostrya virginiana* (Iowa, Mo.)
Dendrothele strumosa (Fries) P.A. Lemke, on *Ostrya virginiana* (Fla.)
Dendrothele subfusispora Burdsall & Nakasone, on *Ostrya virginiana* (Fla.)
Dichostereum pallescens (Schw.) Boidin & Lanquetin, on *Betula papyrifera* (Maine)
Diplomitoporus linbladii (Berk.) R.L. Gilbertson & Ryvarden, on *Betula papyrifera* (Idaho)
Erythricium laetum (Karst.) J. Eriksson & Hjortstam, on *Betula populifolia* (N.Y.)
Fomes fomentarius (L.) Fries, on *Betula alleghaniensis* (Mich., N.H., N.Y., W. Va.), on *Betula papyrifera* (widespread), on *Betula pendula* (N.Y.), *Betula populifolia* (Maine)
Fomes ohiensis Berk., on *Ostrya virginiana* (Iowa)
Fomes robustus Karst., on *Betula lenta* (Iowa, Md., Va., Wisc.), on *Betula nigra* (Iowa, Md., Va., Wisc.), on *Betula papyrifera* (Wisc.)
Fomitella supina (Sw.) Murr. (= *Polyporus supinus* Sw.), on dead wood of *Carpinus caroliniana* (Lower Miss. Valley)
Fomitopsis pinicola (Sw.: Fr.) Karst. [= *Fomes pinicola* (Sw.) Cooke], on *Betula alleghaniensis* (N.H., Vt., Wisc.), on *Betula lenta* (N.H., Vt., Wisc.), on *Betula papyrifera* (Vt., Wisc.), on *Betula populifolia* (N.Y.),
Fomitopsis spraguei (Berk. & Curtis) R.L. Gilbertson & Ryvarden [= *Polyporus spraguei* Berk.& Curtis (= *Tyromyces spraguei* (Berk. & Curtis) Murr.], brown crumply heart rot of trees in the Yellow Birch group (cosmopolitan)
Ganoderma applanatum (Pers.) Pat. [= *Fomes applanatus* (Pers.) Gill], on *Betula alleghaniensis* (Mich.), *Betula papyrifera* (Maine to Minn.), *Betula populifolia* (N.Y.), on *Ostrya virginiana* (widespread)
Ganoderma lucidum (Leyss.) Karst., on *Betula alleghaniensis* (N.Y.)
Ganoderma tsugae Murrill, on *Betula alleghaniensis* (N.Y.)
Gloeocystidiellum clavuligerum (Höhn. & Litsch.) Nakasone, on *Ostrya virginiana* (Mich.)
Gloeocystidiellum fimbriatum Burdsall, Nakasone & Freeman, on wood on *Carpinus caroliniana* (Fla.)
Gloeocystidiellum turpe G. Freeman, on *Ostrya virginiana* (Fla.)
Gloeophyllum sepiarium (Wulfen) Karst. [= *Lenzites sepiaria* (Wulf.) Fries], on wood of *Alnus incana* (Idaho, Wash.), on *Betula alleghaniensis* (N.Y.), on *Betula papyrifera* (Idaho, Wash.)
Gloeophyllum trabeum (Pers.) Murr. [= *Lenzites trabea* (Pers.) Fries, on *Betula papyrifera* (Minn., Mont.)
Gloeoporus dichrous (Fries) Bres. (= *Polyporus dichrous* Fries), on dead wood of all *Alnus* spp. (widespread), on *Betula alleghaniensis* (N.C., S.C.), on *Betula papyrifera* (Ark., Idaho, Mont., Wash.)
Grandinia crustosa (Pers.) Fries, on *Alnus incana* (Idaho), on *Betula papyrifera* (Mass.)
Hapalopilus rutilans (Pers.) Murr., on *Betula papyrifera* (Idaho, Minn.)
Henningsomyces candidus (Pers.) Kuntze, on wood and bark of *Betula papyrifera* (Idaho), on *Betula* sp. (N.Y.)
Hericium coralloides (Scop.) S.F. Gray, on *Betula papyrifera* (Ark.)
Heterobasidion annosum (Fries) Brefeld [= *Fomes annosus* (Fries) Cooke], on *Alnus incana* (Wash.)
Hydnochaete olivacea (Schw.) Banker, on *Alnus serrulata* (Va.), *Alnus viridis* subsp. *crispa* (Va.) *Betula alleghaniensis* (Va.), on *Betula lenta* (N.C.), on *Betula* sp. (Mass., N.Y.), on *Carpinus caroliniana* (Fla.)
Hymenochaete agglutinans Ellis, on trunks and branches of *Alnus incana* subsp. *rugosa* (Conn., Mich., N.Y., Pa.), on *Alnus serrulata* (Fla., Va.), of *Betula alleghaniensis* (Mich., Pa., Va.), on *Betula lenta* (Mich., Pa., Va.), on *Betula* sp. (Va.), on *Corylus cornuta* (Maine)
Hymenochaete badio-ferruginea (Mont.) Lév., on *Betula alleghaniensis* (N.C.)
Hymenochaete cinnamomea Pers., on *Corylus americana* (N.D.)
Hymenochaete corrugata (Fries) Lév., on *Alnus incana* (Idaho), on *Alnus serrulata* (S.C., Ga.), on *Carpinus caroliniana* (Ga.)
Hymenochaete curtisii (Berk.) Morg., on *Carpinus caroliniana* (Ga.)
Hymenochaete pinnatifida Burt, on *Alnus serrulata* (Ga.)
Hymenochaete tabacina (Sow.) Lév., on *Alnus incana* (Idaho), on *Betula lenta* (N.C.)
Hypochnicium geogenium (Bres.) J. Eriksson, on *Alnus incana* (Idaho)
Hyphoderma clavigerum (Bres.) Donk, on *Betula papyrifera* (Minn.)
Hyphoderma heterocystidia (Burt) Donk, on *Carpinus caroliniana* (Mich.)
Hyphoderma mutatum (Peck) Donk, on *Corylus cornuta* (Wash.)
Hyphoderma setigerum (Fries) Donk, on dead twigs of *Betula* sp. (Mich.), on *Corylus cornuta* (Wash.)
Inonotus cuticularis (Bull.) Karst. (= *Polyporus cuticularis* Bull.), on dead wood of *Ostrya virginiana* (Ind.)
Inonotus glomeratus (Peck) Murr., on *Betula papyrifera* (Mich., Mont.)

Inonotus obliqua (Pers.) Pilàt [= *Poria obliqua* (Pers.) Bres.], on *Alnus* spp. (cosmopolitan), on *Betula alleghaniensis* (Northeastern States, W. Va.), *Betula lenta* (Northeastern and Great Lake States), *Betula papyrifera* (New England, Idaho, Mich., Wash.), on *Betula populifolia* Mass., N.H., Pa., Vt.), *Ostrya virginiana* (Pa.)

Inonotus hispidus (Bull.) Karst. (=*Polyporus hispidus* Bull.), wood rot on trees in the Yellow Birch group (widely distributed)

Inonotus obliquus (Pers.) Pilat, on *Betula alleghaniensis* **

Inonotus radiatus (Sow.) Karst. (= *Polyporus radiatus* Sow.), on *Alnus* spp. (widespread), on *Betula alleghaniensis* (N.C.), on *Betula papyrifera* (Minn.), on *Corylus* spp. (uncommon)

Irpex lacteus (Fries) Fries [= *Polyporus tulipiferae* (Schw.) Overh.], on dead wood of *Alnus* species**, on *Betula papyrifera* (Idaho, Wash.), on trees in the Yellow Birch group, *Carpinus caroliniana* (widespread)

Ischnoderma resinosum (Schrad.) Karst. (= *Polyporus resinosus* Schrad.), on *Betula alleghaniensis* (Mich.), on *Betula papyrifera* (Ark., Mich., Minn., Wisc.)

Junghuhnia collabens (Fries) Ryvarden, on *Corylus cornuta* (Oreg.)

Junghuhnia nitida (Pers.) Ryvarden [= *Poria attenuata* (Peck) Peck, *Poria eupora* (Karst.) Cooke], on *Alnus incana* subsp. *rugosa* (Maine), on *Alnus serrulata* (Maine), on *Alnus* sp. (**N.Y.), on *Ostrya virginiana* (N.Y.)

Kavinia himantia (Schw.) Eriksson, on *Ostrya virginiana* (Mass.)

Laetiporus sulphureus (Bull.) Murr. [= *Polyporus sulphureus* (Bull.) Fries, on *Betula papyrifera* (Minn.)

Laxitextum bicolor (Pers.) Lentz, [= *Stereum bicolor* (Pers.) Fries, *Stereum fuscum* (Schrad. Karst.], on *Betula alleghaniensis* (N.H.), on *Betula lenta* (W. Va.)

Lenzites betulina L., brown cubical rot of logs and stumps, on *Alnus incana* (Idaho), on *Alnus serrulata* (Ga.), on *Betula alleghaniensis* (widespread), on *Betula nigra* (Fla., Ga., N.C.), on *Betula papyrifera* (Ark., Idaho, Mich., Minn., Mont.)

Lenzites trabea Pers., on *Alnus* spp. (cosmopolitan)

Leucogyrophana mollusca (Fries) Pouzar, on *Betula* sp. (Mich.)

Merismodes fasciculatus (Schw.) Donk in Singer, on *Alnus serrulata* (Ga., S.C.), on *Alnus* sp. (N.Y.)

Merismodes ochraceus (Hoffm.) D. Reid (= *Solenia ochracea* Hoffm.), on *Alnus* species, and trees in the Yellow Birch group (widespread)

Meruliopsis corium (Fries) Ginns, on *Alnus serrulata* (Ga.), on *Ostrya virginiana* (Md.)

Mycoacia himantia (Schw.) L.W. Miller & Boyle, on *Ostrya virginiana* (Mass.)

Mycorrhaphium adustum (Schw.) Maas G. [= *Steccherinum adustum* (Schw.) Banker], on *Carpinus caroliniana* (Conn.), on *Ostrya virginiana* (N.C.)

Osteina obducta (Berk.) Donk, on *Betula papyrifera* (Mont., Wash.)

Oxyporus latemarginatus (Durieu & Mont.) Donk (= *Poria ambigua* Bres.), on *Ostrya virginiana* (widely distributed)

Oxyporus populinus (Schum.) Donk [= *Fomes connatus* (Fries) Gill.], on *Betula alleghaniensis* (New England States), on *Betula lenta* (New England States), on *Betula populifolia* (Maine), on *Ostrya virginiana* (Mass., Vt.)

Peniophora aurantiaca (Bres.) Höhn. & Litsch., on *Alnus serrulata* (Mo., N.C.)

Peniophora cinerea (Pers.) Cooke, on *Alnus serrulata* (Ga.), on *Carpinus caroliniana* (Miss.), on *Corylus cornuta* (Wash.)

Peniophora erikssonii Boidin, on standing dead limbs of *Alnus* sp. (N.Y.)

Peniophora incarnata (Pers.) Karst., on *Alnus serrulata* (Ga.)

Peniophora nuda (Fries) Bres., on *Betula* sp. (N.Y.), on *Corylus cornuta* (Wash.)

Perenniporia medulla-panis (Jacq.) Donk [= *Poria medulla-panis* (Jacq.) Bres., *Poria unita* (Pers.) Cooke.], on *Betula alleghaniensis* (**widespread), on *Betula papyrifera* (Minn., Wisc.)

Perenniporia subacida (Peck) Donk [= *Poria subacida* (Peck) Sacc.] on *Betula alleghaniensis* (Vt.), on *Betula papyrifera* (N.Y., Wash.), on *Betula* sp. (**, Mich.)

Perenniporia tenuis (Schw.) Ryvarden, on *Alnus serrulata* (Ga.), on *Betula papyrifera* (Mont.)

Phaeolus schweinitzii (Fries) Pat., on *Betula papyrifera* (Idaho)

Phanerochaete affinis (Burt) Parmasto, on *Alnus incana* subsp. *rugosa* (N.H., N.Y.), on *Betula lenta* (Conn.), on *Betula populifolia* (N.H.), on *Betula* sp. (Tenn.), on *Carpinus caroliniana* **

Phanerochaete carnosa (Burt) Parmasto, on *Betula* sp. (N.H.)

Phanerochaete chrysorhiza (Torr.) Budington & Gilbertson, on *Carpinus caroliniana* (Fla.), on *Ostrya virginiana* (Fla.)

Phanerochaete filamentosa (Berk. & Curtis) Burdsall, on *Betula alleghaniensis* (Mich.)

Phanerochaete flavido-alba (Cooke) S.S. Rattan, on *Carpinus caroliniana* (Fla.)

Phanerochaete magnoliae (Berk. & Curtis) Burdsall, on *Betula alleghaniensis* (N.Y.)

Phanerochaete ravenelii (Cooke) Burdsall, on *Alnus serrulata* (Ga.)

Phanerochaete sanguinea (Fries) Pouzar, on *Betula papyrifera* (N.H.)

Phanerochaete sordida (Karst.) Eriksson & Ryvarden, on *Betula papyrifera* (Mass.)

Phanerochaete tuberculata (Karst.) Parmasto, on *Betula papyrifera* (Minn.)
Phanerochaete velutina (DC.) Karst., on *Corylus cornuta* (Wash.)
Phanerochaete viticola (Schw.) Parmasto, on *Betula* sp. (Tenn.)
Phellinus conchatus (Pers.) Quél. [= *Fomes conchatus* (Pers.) Gill.], on *Alnus incana* (Idaho), on *Betula papyrifera* (Mont.), on *Ostrya virginiana* (Vt.)
Phellinus everhartii (Ellis & Galloway) Pilát [= *Fomes everhartii* (Ellis & Gall.) Sehrenk], white spongy heart rot of *Betula alleghaniensis* (N.C., N.J., S.C., Wisc.), *Betula papyrifera* (Idaho, Minn., Wisc.), *Ostrya virginiana* (Wisc.)
Phellinus ferreus (Pers.) Bourd. & Galzin (= *Poria ferrea* Pers.), on *Alnus incana* (Ark., Idaho), on *Alnus* sp. **, on *Betula papyrifera* (Idaho, Mont.), on *Ostrya virginiana* **
Phellinus ferruginosus (Schrad.) Pat., on *Alnus incana* (Idaho, Mont.), on *Alnus incana* subsp. *rugosa* **, on *Betula papyrifera* (Maine, Mont., Pa., Wash.), on *Betula populifolia* (Maine, Pa.), on *Betula* sp. **, on *Corylus cornuta* (Oreg.), on *Ostrya virginiana* (** widely distributed)
Phellinus gilvus (Schw.) Pat. [= *Polyporus gilvus* (Schw.) Fries], on *Alnus incana* (Mont.), on *Betula alleghaniensis* (N.C.), on *Betula lenta* (N.C.), on *Betula nigra* (Ga., N.C.), on *Betula papyrifera* (Wash.), *Carpinus caroliniana* (widely distributed)
Phellinus igniarius (L.) Quél. [= *Fomes ignarius* (L.) J. Kickx f.], on *Alnus incana* subsp. *rugosa* (Vt.), on *Betula alleghaniensis* (Minn.), on *Betula papyrifera* (widespread), on *Betula populifolia* (Maine), on *Carpinus caroliniana* (Vt.), on *Ostrya virginiana* (Mich., N.D., S.D., Vt.)
Phellinus inermis (Ellis & Everh.) G. Cunn., on *Alnus* sp.**
Phellinus laevigatus (Fries) Bourd. & Galzin [= *Poria laevigata* (Fries) Cooke], on *Alnus incana* (Idaho), on *Betula alleghaniensis* (** widespread), on *Betula lenta* (widespread), on *Betula papyrifera* (widespread), on *Betula populifolia* (Maine, N.Y., Pa.)
Phellinus lundellii Niemelä, on *Alnus* spp. (Eastern States), on *Betula* sp. (Eastern States)
Phellinus nigricans (Fries) Karst.[= *Fomes ignarius* (L.) Quél.], on *Alnus incana* subsp. *rugosa* (Vt.), on trees in the Yellow Bireh group (widespread), on *Betula papyrifera* (**Maine to Minn.),on *Carpinus caroliniana* (Vt.),on *Ostrya virginiana* (Mich.,N.D.,S.D., Vt.)
Phellinus pini (Thore) A. Ames, on *Betula papyrifera* (Idaho)
Phellinus pruinicola (Murr.) R.L. Gilbertson, on *Betula* sp.**
Phellinus punctatus (Fries) Pilat [= *Poria punctata* (Fries) Cooke.], on *Alnus incana* (Mont.), on *Alnus* spp. (widespread), on *Betula papyrifera* (Mont.), on *Carpinus caroliniana* (Ark.,La.), on *Ostrya virginiana* (Ohio, Pa., Vt.)
Phellinus viticola (Schw.) Donk, on *Alnus incana* (Idaho), on *Betula* sp. (Mich.)
Phlebia chrysocrea (Berk. & Curtis) Bursall, on *Betula* sp. (N.C.)
Phlebia coccineo-fulva Schw., on *Alnus incana* (Idaho)
Phlebia concentrica (Cooke & Ellis) Kropp & Nakasone, on *Corylus cornuta* (Wash.)
Phlebia ludoviciana (Burt) Nakasone & Bursall, on *Betula nigra* (Wisc.), on *Betula* sp. (Wisc.)
Phlebia merismoides (Fries) *Fries*, on *Alnus incana* (Mont.), on *Betula alleghaniensis* (N.Y.), on *Betula papyrifera* (Idaho)
Phlebia tremellosus (Schrad.) Nakasone & Bursall [= *Merulius tremellosus* Schrad.], wood rot and heart rot of *Betula papyrifera* (Idaho, Mich., Minn., Mont., Wash.)
Phlebiella vaga (Fries) Karst., on *Betula alleghaniensis* (N.C., N.Y.), on *Betula papyrifera* (Minn.)
Phleogena faginea (Fries) Link, on *Carpinus caroliniana*
Physisporinus sanguinolentus (Albertini & Schw.) Pilat., on *Betula* sp. **
Physisporinus vitreus (Pers.) Karst. (= *Poria holoseparans* Murr., on *Carpinus caroliniana* (Fla.)
Piptoporus betulinus (= *Polyporus betulinus* Bull.), on *Betula alleghaniensis* (N.C.), on *Betula papyrifera* (Ark., Idaho, Mich., Minn., Mont., Wash.)
Plicatura nivea (Fries) Karst., on *Alnus incana* (Idaho), on *Betula papyrifera* (Mont.)
Plicaturopsis crispa (Pers.) D. Reid, on *Betula alleghaniensis* (Mich., N.C.), on *Betula lenta* (N.C.), on *Betula papyrifera* (Ark., Minn.)
Polyporus admirabilis Peck, on *Betula alleghaniensis* (Minn.)
Polyporus arcularius (Batsch) Fries, on *Alnus incana* (Mont.)
Polyporus badius (Pers.) Schw., on *Betula glandulosa* (Idaho), on *Betula lenta* (N.C.), on *Betula papyrifera* (Idaho)
Polyporus brumalis (Pers.) Fries, on *Betula papyrifera* (Mich.)
Polyporus mori (Pollini) Fries, on *Betula lenta* (N.C.)
Polyporus varius (Fries) Fries (= *Polyporus elegans* Bull.), on *Betula alleghaniensis* (N.C.), on *Betula papyrifera* (Idaho, Mich., Wash.), rare on *Corylus americana, Corylus cornuta*
Porotheleum fimbriata (Pers.) Fries, on *Betula papyrifera* (Wash.)

Postia caesia (Schrad.) Karst. [= *Polyporus caesius* Schrad., *Leptoporus caesius* (Schrad.) Quél.], on *Betula papyrifera* (Wash.), on dead wood of trees in the Yellow Birch group (widespread)

Postia sericomollis (Romell) Juelich, on *Betula alleghaniensis* **

Postia undosa (Peck) Jülich (= *Polyporus undosus* Peck), on *Betula alleghaniensis* (N.H., Vt.)

Pseudotomentella flavovirens Höhn. & Litsch.) Svr_ek, on wood on *Betula alleghaniensis* (N.Y.)

Pycnoporus cinnabarinus (Jacq.) (= *Polyporus cinnabarinus* Jacq.), on *Alnus serrulata* (N.C.), on dead wood of *Betula glandulosa* (Idaho), on *Betula papyrifera* (Idaho, Minn., Mont., Oreg., Wash.)

Pycnoporus sanguineus (L.) Murr., on *Betula nigra* (N.C.), on *Carpinus caroliniana* (Miss.)

Radulodon casearium (Morg.) Ryvarden, on *Betula papyrifera* (Minn.)

Rectipilus fasciculatus (Pers.) Agerer, on *Betula* sp. (N.Y.), on *Ostrya virginiana* (La.)

Rigidoporus crocatus (Pat.) Ryvarden, on *Betula papyrifera* (Minn.)

Schizophyllum commune Fries, on *Betula lenta* (N.C.), on *Betula nigra* (Fla.), on *Betula papyrifera* (Minn.), on *Betula* spp. (widespread), on *Carpinus caroliniana* (widespread)

Schizopora paradoxa (Schrad.) Donk (= *Poria versipora* Pers.), on *Alnus* spp. (cosmopolitan), on *Betula alleghaniensis* (Great Lake States), *Carpinus caroliniana* (Mich.)

Scytinostroma galactinum (Fries) Donk [= *Corticium galactinum* (Fries) Burt], wood rot of *Betula papyrifera* (N.H.), *Betula populifolia* (N.H.)

Scytinostroma portentosum (Berk. & Curtis) Donk, on *Betula alleghaniensis* (Vt.)

Sistotrema brinkmannii (Bres.) Eriksson, on wood of *Betula nigra* (Ga.)

Skeletocutis nivea (Jungh. J. Keller (= *Polyporus semipileatus* Peck), on *Betula papyrifera* (Idaho)

Spongipellis unicolor (Schw.) Murr., on *Betula* sp. (Minn.)

Steccherinum fimbriatum (Pers.) Eriksson, on *Ostrya virginiana* (Minn., N.Y.)

Steccherinum ochraceum (Pers.) S. F.Gray, on *Alnus incana* subsp. *rugosa* (Maine, Mich., N.Y.), on *Alnus serrulata* (Maine, N.Y.), on *Betula alleghaniensis* (N.Y., Va., W. Va.), on *Betula papyrifera* (Iowa, Mich., N.J., Wisc.), on *Betula pendula* (Mich.), on *Carpinus caroliniana* (Ga., Va.), on *Ostrya virginiana* (N.Y.)

Stereum albobadium (Schw.) Fries, on *Alnus* spp. (widely distributed), on *Ostrya virginiana* (Md.)

Stereum gausapatum (Fries) Fries, on *Carpinus caroliniana* (widespread)

Stereum hirsutum Willd., on *Alnus* spp. (widely distributed), on *Betula alleghaniensis* (Conn., Maine, N.Y.), on *Betula lenta* (Conn., Maine, N.Y.), on *Betula nigra* (Oklahoma), on *Betula papyrifera* (Ark., Conn., Idaho, Mass., N.H., N.Y., Vt., Wash.), on *Corylus cornuta* (Wash.)

Stereum ochraceo-flavum (Schw.) Ellis, on *Alnus serrulata* ((Del., N.Y.), on *Betula lenta* (Conn.), on *Betula populifolia* (Maine, N.Y.), on *Corylus americana* (Mo.)

Stereum ostrea (Blume & Nees) Fries [= *Stereum fasciatum* Schw., *Stereum lobatum* (G. Kuntze) Fries], on *Alnus* spp. (widespread), on *Betula* spp. (widespread), on *Carpinus caroliniana* (widespread)

Stereum striatum (Fries) Fries (= *Stereum sericeum* Schw.), on *Betula lenta* (W. Va.), on *Betula nigra* (Md., N.C.), on *Betula papyrifera* (W. Va.), on *Carpinus caroliniana* (widely distributed)

Stereum umbrinum Berk. & Curtis, on wood of *Carpinus caroliniana* (widely distributed)

Thelephora albidobrunnea Schw., on *Carpinus caroliniana* (N.C.)

Thelephora caryophyllea Fries, on *Betula nigra* (Ga.)

Tomentella botryoides (Schw.) Bourd. & Galzin, on *Betula* sp. (Mich., N.Y.)

Tomentella bryophila (Pers.) M. Larsen, on wood of *Betula* sp. (Mich., N.Y., Ohio)

Tomentella ferruginea (Pers.) Pat., on wood of *Betula* sp. (N.Y.)

Tomentella lateritia Pat., on wood of *Betula* sp. (N.Y.)

Tomentella neobourdotii M. Larsen, on wood of *Betula* sp. (Mich., N.Y.), on *Carpinus caroliniana* (N.Y.)

Tomentella olivescens (Berk. & Curtis) Bourd. & Galzin, on wood of *Betula* sp. (N.Y.)

Tomentella punicea (Albertini & Schw.) J. Schröt., on wood of *Betula* sp. (Mass.)

Tomentella ruttneri Litsch., on wood of *Betula alleghaniensis* (N.Y.)

Tomentella sublilacina (Ellis & Holway) Wakef., on wood of *Betula alleghaniensis* (N.Y., on wood of *Betula* sp. (Mass., Mich., N.Y., W. Va.)

Tomentellastrum badium (Link) M. Larsen, on wood of *Betula alleghaniensis* (N.Y.)

Trametes hirsuta (Wulf.) Quél. [= *Coriolus hirsutus* (Wulf.) Quél., *Polyporus hirsutus* Wulf.], wood rot of *Alnus species*, on *Betula alleghaniensis* (W. Va.), on *Betula nigra* (Ga., Okla.), on *Betula papyrifera* (Ark., Idaho, Minn., Mont., Wash.), on *Carpinus caroliniana* (widespread), on *Corylus cornuta* (Oreg.), on *Ostrya virginiana* (Vt.)

Trametes pubescens (Schum.) Pilàt [= *Coriolus pubescens* (Schum.) Quél., *Polyporus pubescens* Schum.],on *Alnus species,* on *Betula alleghaniensis* (Mich., on *Betula papyrifera* (Idaho, Mich., Minn. Mont., Wash.), on *Carpinus caroliniana,* (widely distributed)

Trametes versicolor (L.) Pilàt [= *Coriolus versicolor* (L.) Quél., *Polyporus versicolor* L.], on all *Alnus* species, *Betula lenta* (N.C., S.C.), on *Betula nigra* (N.C.), on *Betula papyrifera* (Ark., Idaho, Mont., Wash.), on *Carpinus caroliniana* (widespread), on *Corylus cornuta* (Wash.), on *Ostrya virginiana* (Vt.)

Trichaptum biforme (Fries) Ryvarden [= *Polyporus pargamenus* Fries, *Hirschioporus pargamenus* (Fries) Bond. & Singer], on dead wood of all *Alnus* spp. (Nearly cosmopolitan), on *Betula lenta* (N.C.), on *Betula nigra* (Ga., N.C.), on *Betula papyrifera* (Ark., Idaho, Mich., Minn., Mont.)

Trichaptum subchartaceum (Murr.) Ryvarden, on *Betula papyrifera* (Idaho, Mont.)

Typhula phacorrhiza (Reichard) Fr., on old leaves of *Alnus* sp. (N.Y.)

Tyromyces chioneus (Fries) Karst. [= *Tyromyces albellus* (Peck) Bond. & Singer, *Polyporus albellus* Peck], on *Alnus* spp., on *Betula alleghaniensis* (N.C.), on *Betula papyrifera* (Ark., Idaho, Mich., Mont., Wash.), on *Corylus americana, Corylus cornuta* (unk.)

Wolfiporia cocos (F.A. Wolf) Ryvarden & Gilbertson (= *Daedalea extensa* Peck), on wood of *Betula alleghaniensis* (Wisc.), on *Betula papyrifera* (Mass.)

AGARICALES

Armillaria mellea (Vahl.) P. Kumm. [= *Armillariella mellea* (Vahl.) Karst., root rot, on *Betula allegeniensis* (Northeastern States), on *Betula papyrifera* (Minn.), on *Carpinus caroliniana* (Fla.), on *Corylus avellana* (Oreg., Wash.), on *Ostrya virginiana* (widely distributed)

Armillariella tabescens (Scop.) Sing. [= *Clitocybe tabescens* (Scop.) Bres.], root rot, on *Ostrya virginiana* (Fla.)

Boletus scaber Fries var. *fusca* Peck, mycorhizal with *Betula*
papyrifera (Mich.)

Coprinus disseminatus (Pers.) S.F. Gray, on *Betula nigra* (N.C.)

Cortinarius sp., mycorhizal with *Betula papyrifera* (Mich.)

Crepidotus albescens (Murr.) Redhead, on *Betula* sp. (N.Y.)

Crepidotus alnicola Hesler & A.H. Smith, on bark of *Alnus incana* subsp. *rugosa* (Mich.)

Crinipellis zonata (Peck) Pat., on *Betula* sp. (N.C.)

Cyphellopsis anomala (Pers.) Donk, on *Alnus serrulata* (N.C.), on *Betula populifolia* (N.H.), on *Corylus cornuta* (Wash.)

Hypholoma sublateritium (Fries) Quél., on *Betula alleghaniensis* (Mich.)

Lentinus strigosus (Schw.) Fries, on wood of *Betula nigra* (Ga.), *Betula papyrifera* (Ark.), on *Betula* sp. (Minn.)

Marasmius rotula (Scop.) Fries, on *Betula* sp. (Mich.

Panellus pusillus (Pers.) Burdsall & O.K. Miller, on *Ostrya virginiana* (Fla.)

Panellus serotinus (Pers.) Kuehner(= *Pleurotus serotinus* Schrad.), on *Alnus incana* (Idaho), on *Betula alleghaniensis* (Mich.), Wisc.

Panellus stypticus (Bull.) Karst., on *Betula alleghaniensis* (N.C.), on *Betula lenta* (N.C.)

Panus strigosus Berk. & Curtis, on *Betula alleghaniensis* (Mich.)

Pholiota adiposa (Fries) P. Kumm., Butt rot on *Alnus incana* (Idaho, Wash.)

Pholiota alnicola (Fries) Singer, on *Alnus incana* (Idaho)

Pholiota squarrosa (Fries) Kumm., on *Betula alleghaniensis* (N.Y.)

Pholiota squarrosoides Peck, on *Betula alleghaniensis* (Mich.), on *Betula papyrifera* (Ark.)

Pholiota sp., on *Betula alleghaniensis* (N.H.)

Pleurotus laevis (Berk. & Curtis) Singer, on *Betula alleghaniensis* (Mich.), on *Betula papyrifera* (Wash.)

Pleurotus minutus Peck, on *Betula nigra* (N.C.)

Pleurotus ostreatus (Jacq.) Kumm., on *Betula papyrifera* (Ark.), on *Carpinus caroliniana* (N.C.), on *Ostrya virginiana* (N.Y.)

Pleurotus similis Peck, on *Ostrya virginiana* (N.Y.)

Pluteus atricapillus (Batsch) Fayod, on *Betula papyrifera* (Idaho), on *Betula* sp. (Mich.)

Stromatocyphella conglobata (Burt) W.B. Cooke, on dead standing branches of *Alnus* spp. (Mich., N.H., N.Y.)

Xeromphalina kaufmanii A.H. Smith, on *Betula* sp. (Mass.)

HYPHOMYCETES

Acrodictys atroapicula Wang & Sutton, on rotten wood of *Betula papyrifera* (Mass.

Alternaria sp., on *Phytolacca americana* (N.Y., Tex., Wisc.)

Anguillospora coryli Redhead & G.P. White, leaf spot on *Corylus americana* (Wisc.)
Anguillospora vermiformis (J.J. Davis) Redhead & G.P. White, leaf spot on *Alnus incana* subsp. *rugosa* (Wisc.), on *Alnus viridis* subsp. *crispa* (Wisc.), on *Corylus americana* (Wisc.), on *Corylus cornuta* (Wash., Wisc.)
Aspergillus alliaceus Thom & Church, on *Opuntia humifusa* (Tex.)
Cercoseptoria caryigena (Ellis & Everh.) J. J. Davis, leaf spot on *Carpinus caroliniana* (Wisc.)
Cercoseptoria septoriopsidis (Dearn. & Overh.) Constantinescu, leaf spot on *Betula lenta* (Pa.)
Cercospora corylina Ray, leaf spot on *Corylus americana* (Okla.), on *Corylus cornuta* (Okla.)
Cercospora flagellaris Ellis & G. Martin, leaf spot on *Phytolacca americana* (N.J. to Fla., Tex., Ill.)
Cercospora mirabilis Tharp, leaf spot on *Mirabilis jalapa* (Fla., Tex.)
Cercospora oxybaphi Ellis & Halst., leaf spot on *Mirabilis nyctaginea* (Iowa, Ill., Iowa, Kans., Nebr., Ohio, Tex., Wisc.)
Cercospora sp., leaf spot on *Ostrya virginiana*
Cladosporium caducum J. J. Davis, on dead leaves of *Betula nigra* (Wisc.)
Cladosporium caryigenum (Ellis & Langl.) Gottwald, on *Carpinus caroliniana* (Ga.)
Cladosporium caryigenum (Ellis & Langl.) Gottwald var. *carpinum* Ellis & Everh., on *Carpinus caroliniana* (Wisc.)
Clasterosporium cornigerum Ellis & Everh. (= *Cladosporium pulchrum* Ellis & Everh. ?), leaf spot on *Carpinus caroliniana* (Md., N.Y.**)
Coniothecium betulinum Corda, on *Betula* sp. (Mass.)
Conoplea fusca Pers., on *Ostrya virginiana* (Minn.)
Conoplea globosa (Schw.) S.J. Hughes, on *Betula* sp. (Mass.), on *Carpinus caroliniana* (Conn.), on *Ostrya virginiana* (Md., Pa., W. Va.)
Conoplea juniperi S.J. Hughes (= *Streptothrix atra* Berk. & Curtis), on twigs of *Corylus* sp.**
Conoplea olivacea (Schw.) S.J. Hughes, on *Ostrya virginiana* (N.Y.)
Coryne sarcoides (Jacq.) Tul., on *Alnus incana* subsp. *rugosa***, *Betula alleghaniensis***, *Betula papyrifera* (Mich.)
Dendryphium nodulosum Sacc., leaf spot on *Phytolacca americana* (Tex.)
Dictyocatenulata alba Finley & E.F. Morris, on bark of *Betula* sp. (N.Y.
Epicoccum sp., on *Betula alleghaniensis* (Mich.)
Fusarium carpineum J.J. Davis, on *Carpinus caroliniana* (Wisc.)
Fusarium lateritium Nees [= *Fusarium miniatum* (Berk. & Curtis) Sacc.], on stump of *Betula alleghaniensis***, on twigs on *Ostrya virginiana* (Ohio)
Fusarium sp., on bark of *Betula alleghaniensis***
Fusarium sp., root rot of *Ostrya virginiana* (Fla.)
Graphium sp., isolated from wood of *Betula alleghaniensis* (N.H.)
Haplotrichum conspersum (Link) Holubová-Jechová, on logs of *Betula* sp. (Mass.)
Haplotrichum curtisii (Berk.) Holubová-Jechová, on bark of *Ostrya virginiana* (N.Y.)
Helicoma microscopicum (Ellis) Linder, on *Alnus serrulata* (N.J.)
Helminthosporium macrocarpum Grev., on *Carpinus caroliniana***, on *Corylus* sp.**
Helminthosporium interseminatum Berk. & Rav., on stems of *Phytolacca americana* (S.C.)
Microdochium lunatum (Ellis & Everh.) Arx, on *Opuntia humifusa* (Ala., Fla., Tex.)
Passalora alni Chupp & H.C. Greene, (= *Cercospora alni* Chupp & H. C. Greene), leaf spot on *Alnus viridis* subsp. *crispa* (Wisc.)
Penicillium sp., isolated from wood of *Betula alleghaniensis* (N.H.)
Periconia parasitica Peck [= *Sporocybe parasitica* (Peck) Sacc.], on *Carpinus caroliniana***
Phialophora sp., isolated from wood of *Betula alleghaniensis* (N.H.)
Phymatotrichopsis omnivorum (Duggar) Hennebert, root rot on *Alnus glutinosa* (Tex.), on *Betula nigra* (Tex.), on *Carpinus caroliniana* (Tex.), on *Corylus americana* (Tex.), on *Corylus cornuta* (Tex.), on *Mirabilis jalapa* (Tex.), on *Mirabilis nyctaginea* (Tex.), on *Ostrya virginiana* (Tex.), on *Phytolacca americana* (Tex.)
Polyactis pulvinata Berk. & Curtis, on *Alnus incana* subsp. *rugosa***
Pseudocercosporella caryigena (Ellis & Everh.) Sivanesan, leaf spot on *Carpinus caroliniana* (Wisc.)
Rhinotrichum curtisii Berk., on *Betula populifolia***
Rhizoctonia crocorum (Pers.) DC., root rot of *Phytolacca americana* (Tex.)
Rhizoctonia solani Kuehn, seedling blight of *Carpinus caroliniana* (Mo.), of *Mirabilis jalapa* (Fla.), of *Ostrya virginiana* (Mo.), *Phytolacca americana* (Fla., Tex.)
Sclerotiomyces colchicus Woronichin, on leaves of *Corylus americana* (Wisc.)
Sporotrichum sp., on *Betula alleghaniensis* (Mich.)
Stilbella flavipes (Peck) Seifert, on *Alnus* sp. (N.H.)

Stilbella fusca (Sacc.) Seifert, on stump sap of *Betula* sp. (N.Y.)
Strumella coryneoidea Sacc. & Wint., branch and trunk canker on *Ostrya virginiana* (Md., Pa., W. Va.)
Taeniolella alta (Ehrenb.) S.J. Hughes (= *Torula alni* Peck, on *Alnus incana* subsp. *rugosa* (Minn., N.Y.**)
Teratosperma cornigerum (Ellis & Everh.) Ellis, on bark and leaves of *Carpinus caroliniana* (Md., N.Y., Wisc.)
Torula ligniperda (Willd.) Sacc., red heartwood stain on *Betula lenta* (Northeastern States), on *Betula papyrifera* (Northeastern States)
Trichoderma viride Pers., on stumps of *Alnus* sp.**, on *Betula alleghaniensis* (N.Y.)
Trichothecium sublutescens (Peck) Sacc., on *Alnus incana* subsp. *rugosa***
Tubercularia vulgaris Tode, on *Betula alleghaniensis***
Xenosporium berkeleyi (Curtis) Pirozynski, on *Betula nigra* (N.C.)

SPHAEROPSIDALES

Aplosporella alnicola (Peck) Petr. & Syd.(= *Sphaeropsis alnicola* Peck), on *Alnus glutinosa* (N.Y.), on *Alnus incana* subsp. *rugosa* (N.Y.), on *Betula pendula* (N.Y.)
Ascochyta oxybaphi Trel., on *Mirabilis nyctaginea* (Iowa, Wisc.)
Asteroma alneum (Pers.) Sutton [= *Gloeosporium cylindrospermum* (Bon.) Sacc., *Gloeosporium alnicola* Dearn. & House], on *Alnus incana* subsp. *rugosa*** (Wisc.), on *Alnus* sp. (N.Y.)
Asteroma microspermum (Peck) Sutton (= *Septoria microsperma* Peck, *Gloeosporium betulae-luteae* Sacc. & Dearn.), leaf spot on *Betula alleghaniensis* (N.Y.), *Betula lenta* (N.Y., Pa., W.Va.), on *Betula papyrifera* (Wisc.)
Botryodiplodia valsoides (Peck) Sacc., on *Betula populifolia***
Catinula turgida (Fries) Desm., see *Pezicula corylina* (Helotiales)
Cytospora chrysosperma (Pers.) Fries, on *Betula papyrifera* (Minn.)
Cytospora decipiens Sacc., on *Betula papyrifera* (Minn.), on *Carpinus caroliniana***
Cytospora guttifera (DC.) Fries, on *Corylus* sp.**
Cytospora leucosperma (Pers.) Fries, on *Carpinus caroliniana***
Cytospora umbrina (Bonord.) Sacc. (= *Cytospora truncata* Sacc.), on *Alnus incana* subsp. *rugosa***
Depazea carpinea (Schw.) Sacc., on dead leaves of *Carpinus caroliniana* (N.C.)
Diplodia corylii Fckl. on dead twigs of *Corylus americana* (Mich.)
Diplodia opuntiae Sacc., on *Opuntia humifusa* (Md., Pa.)
Diplodia sarmentorum Fries, on twigs of *Corylus avellana* (Oreg.)
Discosia artocreas Tode, on fallen leaves of *Betula populifolia* (Maine**)
Discosia alnea Lib., on leaves of *Alnus viridis* subsp. *crispus***
Gelatinosporium betulinum Peck, on *Betula alleghaniensis* (N.Y., on *Betula lenta* (N.Y.)
Gelatinosporium fulvum Peck, on limbs of *Betula* sp. (New England)
Hendersonia opuntiae Ellis & Everh., on *Opuntia humifusa* (N.J.)
Leptothyrium alneum (Lév.) Sacc. (= *Melasmia alnea* Sacc.), on leaves of *Alnus incana* subsp. *rugosa***
Micropera sp., on dead trunk of *Betula papyrifera***
Phoma apocrypta Ellis & Everh., on stems of *Phytolacca americana* (Tex.)
Phoma phillipsiana S. & R., on *Alnus viridis* subsp. *crispa***
Phoma sordida Sacc., on *Carpinus caroliniana***
Phoma sp., on *Opuntia humifusa* (Okla.)
Phomopsis sp., limb canker and twig dieback, on *Betula alleghaniensis* (New England States), on *Betula papyrifera* (New England States)
Phyllosticta betulina Sacc., leaf spot on *Betula lenta*(Mass., **), on *Betula nigra* (Okla.), on *Betula pendula* (N.Y.)
Phyllosticta concava Seaver, on *Opuntia humifusa* (Okla.)
Phyllosticta coryli West., leaf spot on *Corylus americana* (Ind., Iowa, Mo., Tex.), on *Corylus cornuta* (Wash.)
Phyllosticta hesperidearum (Cattaneo) Penz., on *Carpinus caroliniana* (Colo.)
Phyllosticta maculiformis Sacc., on fallen leaves of *Alnus* sp.**
Phyllosticta phytolaccae Cooke, leaf spot on *Phytolacca americana* (Ala., N.J., S.C.)
Phyllosticta sp., leaf spot on *Carpinus caroliniana* (Okla.)
Phyllosticta sp., on leaves of *Corylus americana* (Wisc.)
Phyllosticta sp., leaf spot on *Mirabilis nyctaginea* (Wisc.)

Piggotia coryli (Desm.) Sutton [= *Gloeosporium coryli* (Desm.) Sacc.], leaf spot on *Corylus americana* (Mich.,**, Okla., Wisc.), *Corylus cornuta* (N.J., N.Y.**, Vt., Wisc.), *Corylus avellana* (N.J.)

Pilidium concavum (Desm.) Höhn., on *Corylus americana* (Wisc.)

Rhabdospora maculans Sacc. & Berl., on twigs of *Alnus incana* subsp. *rugosa*(**), on *Alnus serrulata* (S.C.)

Septoria alni Sacc. (= *Septoria alnifolia* Ellis & Everh., *Septoria alnicola* Cooke), leaf spot on *Alnus glutinosa* (Wisc.), on *Alnus incana* subsp. *rugosa* (N.Y.**, Wisc.), on *Alnus serrulata* (N.Y.), on *Alnus viridis* subsp. *crispa* (N.Y., Wisc.),

Septoria betulae Pass. [non *Septoria betulae* (Lib.) West., = *Septoria betulicola* Peck, *Septoria betulina* Pass., *Septoria carpinea* J.J. Davis] leaf spot on *Betula alleghaniensis* (N.Y.**, Wisc.), *Betula lenta* (Mass., Vt.), *Betula papyrifera* (Mass., N.Y.**, Oreg., Wash., Wisc.), *Betula pendula* (Iowa, Wisc.), *Betula populifolia* (Kans., Vt., Wisc.), *Betula pumila* (Wisc.), on *Carpinus caroliniana* (Wisc.)

Septoria betulae-odoratae Bubák & Vleugel, on *Betula papyrifera* (Wisc.)

Septoria corylina Peck, leaf spot on *Corylus americana* (Mich., Nebr., Wisc.), on *Corylus cornuta* (**, Mass. to N.J. and Wisc.)

Septoria hamamelidis Peck, on *Carpinus caroliniana***

Septoria ostryae Peck, leaf spot on *Corylus americana* (Mich., Minn., Nebr., N.Y., Wisc.), on *Corylus cornuta* (Minn., N.Y., Oreg., Wash., Wisc.), on *Ostrya virginiana* (Iowa, N.Y.**, Va., Wisc.)

Septoria phlyctaenoides Berk. & Curtis., leaf spot on *Phytolacca americana* (N.J., N.Y., Ohio, Tex.)

Septoria weiriana Sacc., leaf spot on *Alnus viridis* subsp. *crispa* (Wisc.)

Sphaeronaema coryli Peck, on *Corylus* sp.**, anamorph of *Pezicula corylina* (*Leotiales*)

Sphaeronaema pruinosa Peck, on *Alnus* sp.**

Sphaeropsis alni Cooke. & Ellis, on twigs of on *Alnus serrulata* (N.J., S.C.)

Sphaeropsis betulae Cooke., on twigs of *Betula alleghaniensis* (N.Y.), on *Betula populifolia* (N.Y.**)

Sphaeropsis betulae Cooke. var. *foliicola* J.J. Davis, on leaves of *Betula papryrifera* (Wisc.)

Sphaeropsis carpinea Sacc. & Br. var. minor Peck, on *Carpinus caroliniana***

Sphaeropsis coryli Ellis & Everh., on dead branches of *Corylus americana* (N.J., N.Y.**), on *Corylus cornuta* (N.J., N.Y.)

MELANCONIALES

Cheirospora botryospora (Mont.) Hughes (= *Thyrsidium botryosporum* Mont.), on *Carpinus caroliniana***

Colletotrichum sp., on midribs of *Corylus americana* leaves (Wisc.)

Coryneum betulinum Schulzer, on *Betula nigra* (N.C.), on *Betula* sp. (N.J.)

Coryneum compactum Berk. & Br., on *Betula papyrifera***

Coryneum kunzei Corda, on *Betula populifolia***, perhaps the conidial state of *Pseudovalsa longipes*

Coryneum umbonatum Nees, on *Betula lenta* (N.C.), on *Carpinus caroliniana***

Cryptocline betularum (Ellis & Martin) Arx [= *Gloeosporium betularum* Ellis & Martin], on *Betula lenta* (Ill., N.J.,**, Pa.,Tex.), on *Betula nigra* (** Mass. to Fla., Tex., Wisc.), on *Betula papyrifera* (Colo., Okla., Wisc.)

Cylindrosporella betulae-papyriferae (Dearn. & Overh.) Arx, [= *Gloeosporium betulae-papriferae* Dearn. & Overh., on leaves of *Betula papyrifera* (N.Y.**, Pa.)

Cryptosporium neesii Corda, on *Betula* sp.**, on *Alnus* sp. (Calif.)

Cryptosporiopsis coryli (Peck) Sutton, on *Corylus rostrata***

Cryptosporiopsis fasciculata (Tode ex Tul.) Petr., parasitic on twigs of *Carpinus caroliniana* (Conn., N.Y., Wisc.)

Cylindrosporium betulae J.J. Davis, on *Betula papyrifera* (Del., N.Y.**, Wisc.), on *Betula populifolia* (Wisc.), on *Betula pumila* (Wisc.)

Cylindrosporium dearnessii Ellis & Everh. [*Phleospora dearnessii* (Ellis & Everh.) Höhn.], leaf spot on *Carpinus caroliniana* (Mich.), on *Ostrya virginiana* (Va.)

Cylindrosporium vermiforme J.J. Davis., leaf spot on *Alnus incana* subsp. *rugosa* (Wisc.), *Alnus viridis* subsp. *crispa* (Wisc.), *Corylus americana* (Wisc.)

Discula betulina (Westend.) Arx [= *Gloeosporium betulinum* (Westend.) Petr., *Gloeosporium betulicola* Sacc. & Dearn.], leaf spot on *Betula nigra* (N.C.), on *Betula populifolia* (N.Y.)

Discula peckiana Sacc. (*Discella discoidea* Cooke & Peck), on *Carpinus caroliniana*

Gloeosporium lunatum Ellis & Everh., on *Opuntia humifusa* (Ala., Fla., Tex.)

Melanconium betulinum Schm. & Kuntze, on *Betula papyrifera*** (New England, Minn.), on *Betula populifolia***

Melanconium bicolor Nees, on *Alnus incana* subsp. *rugosa***, *Betula alba***, *Betula nigra* (N.C., w. Va.), *Betula papyrifera***, on *Ostrya virginiana***

Melanconium parvulum D. & B., on *Betula alba***, on *Betula populifolia***

Melanconium zonatum Ellis & Everh., on *Ostrya virginiana***

Monostichella alni (Ellis & Everh.) Arx (= *Gloeosporium alni* Ellis & Everh.), leaf spot on *Alnus serrulata* (W.Va.), on *Alnus glutinosa***

Monostichella robergei (Desm.) Höhn. [= *Gloeosporium robergei* Desm. Also see *Sphaerognomonia carpinea* (Sphaeriales)],leaf spot, defoliation, on *Carpinus caroliniana* (N.Y., Wisc.), on *Ostrya virginiana* (N.J., N.Y., Okla., Pa., Wisc.)

Myxosporium carpini Peck, on twigs of *Carpinus caroliniana* (N.Y., R.I.)

Naemaspora crocea Pers., on *Betula populifolia***

Scolecosporium coryli Dearn. & House, on leaves of *Corylus americana* (N.Y.**)

Septogloeum profusum (Ellis & Everh.) Sacc., leaf spot on *Corylus americana* (Ind., Mass., Miss.)

Septomyxa carpini Peck, on *Carpinus caroliniana***

Steganosporium pyriforme (Hoffm.) Corda, on twigs of *Betula lenta* (Vt.)

Vermicularia cacti (Schw.) Starb., on *Opuntia humifusa* (southeastern United States)

APPENDIX II

A List of Some Insects Associated with Plant Species in this Treatment
by J. Kenneth Dean

COLLEMBOLA

Diapheromera femorata Say, particularly fond of *Corylus*
Oecanthus latipennis Rly., on small white birches

THYSANOPTERA

Hoplothrips corticis (DeG.), under *Betula* bark
Hoplothrips karnyi var. *major* Hood, under bark of Betula

ORTHOPTERA

Oecanthus latipennis Riley, on *Betula populifolia*
Podisma glacialis Scudder, on *Corylus*

HEMIPTERA

Pentatomidae
Meadorus lateralis Say, on *Betula alleghaniensis*
Piesmidae
Piesma cinerea (Say), on *Betula*
Tingitidae
Corythuca bellula Gib., on *Alnus rugosa*
Corythucha pallipes Parsh, on *Betula papyrifera*, and *Ostrya virginiana*
Corythuca pergandei Heid., common on alder
Microphylellus longistris Knight, on *Corylus americana*
Psallus alnicenatus Kngt., on *Alnus incana*
Psallus alnicola Douglas & Scott, on *Alnus* spp.
Miridae
Ceratocapsus incisus Knight, on *Carpinus caroliniana*
Ceratocapsus pilosulus Knight, on *Corylus americana*, *Ostrya virginiana*
Ceratocapsus pumilus (Uhler), on *Betula nigra*
Deraeocoris alnicola Knight, breeds on *Alnus*
Deraeocoris betulae Knight, on *Betula alleghaniensis* predacious on aphids
Deraeocoris poecilus (McAtee), on *Betula nigra*
Diaphnidia pellucida Uhler, on *Ostrya virginiana*
Lophidea media (Say), on *Betula nigra* and *Corylus* sp.
Lygus (Neolygus) alni Kngt., breeds on *Alnus incana*
Lygus (Neolygus) canadensis Kngt., breeds on *Corylus rostrata*
Lygus (Neolygus) confusus Kngt., on "white birch"
Lygus (Neolygus) fagi Kngt., perhaps breeds on *Betula alleghaniensis*
Lygus (Neolygus) hirticulus VanD., reared from yellow birch
Lygus (Neolygus) johnsoni Kngt., on *Carpinus caroliniana*
Lygus (Neolygus) neglectus Kngt., on *Carpinus caroliniana*
Lygus (Neolygus) ostryae Kngt., on *Ostrya virginiana*
Microphylellus longirostris Knight, on *Corylus americana*
Microphylellus modestus Reuter, on *Corylus americanus*
Neolygus fagi Knight, on *Betula alleghaniensis*

Neolygus johnsoni Knight, on *Carpinus caroliniana*
Neolygus ostryae Knight, on *Ostrya virginiana*
Orthotylus alni Knight, on *Alnus rugosa*
Orthotylus cruciatus on *Betula populifolia*
Orthotylus necopinus Van Duzee, on *Betula alleghaniensis*
Phytocoris canadensis Van Duzee, on *Carpinus caroliniana*
Phytocoris confluens Reuter, on *Betula nigra*
Phytocoris erectus Van Duzee, on *Carpinus caroliniana*
Phytocoris lacunosus Knight, on *Carpinus caroliniana*
Phytocoris puella Reuter, on *Betula nigra*
Plagiognathus politus Uhler, on *Betula*, *Corylus*
Psallus parshley Knight, on *Betula pumila*
Reuteria fuscicornis Knight, on *Carpinus caroliniana* and *Ostrya virginiana*

HOMOPTERA

Membracidae
Carynota marmorata Say, on *Alnus*
Ceresa bubalus Fab., Buffalo Tree Hopper, on *Corylus*
Ceresa taurina Fitch, on *Corylus*
Telamona tristis Fitch, on *Corylus*
Telamona tristis Fitch var. *coryli* Fitch, on *Corylus*
Cicadellidae
Alebra albostriella (Fallen), on *Betula*
Empoasca fabae (Harris), The Potato Leafhopper, attacks and causes deformation of *Betula* twigs
Erythroneura sp., on *Betula*
Oncopsis sobrius Walker, on *Betula*
Oncopsis nigrinasi Fitch, on *Ostrya virginiana*
Oncopsis variabilis Fitch, on *Betula*
Fulgoridae
Metcalfa pruinosa (Say), on *Betula*
Chermidae
Calophya nigripennis Riley, on *Betula papyrifera*
Psyllia striata Patch, abundant on *Betula alleghaniensis*
Psyllia carpinicola Crawf., on *Betula alleghaniensis*, *Betula papyrifera*
Psyllia cephalica Crawf., on ironwood
Psyllia annulata Fitch, on *Betula papyrifera*
Aphidae
Aphis craccivora Koch, on *Mirabilis jalapa*
Aphis fabae Scopoli, on *Mirabilis jalapa*, *on Phytolacca americana*
Aphis oenotherae Oestlund, on *Mirabilis jalapa*
Aphis spiraecola Patch, on *Phytolacca americana*
Calaphis alnosa Pepper, on *Alnus rugosa*
Calaphis betulaecolens (Fitch), Common Birch Aphid, on *Betula alleghaniensis*, *Betula lenta*, *Betula nigra*, *Betula papyrifera*, *Betula pendula*, *Betula populifolia*
Calaphis betulae (Buckton), on *Betula* sp.
Calaphis betulella Walsh, on *Betula papyrifera*
Calaphis callipterus (Hartig), on *Betula populifolia*
Calaphis granovskyi Palmer, on *Betula papyrifera*, *Betula pendula*
Calaphis leonardi Quednau, on *Betula populifolia*
Euceraphis betulae (Koch), European Birch Aphid, on *Alnus*, on *Betula alleghaniensis*, *Betula lenta*, *Betula papyrifera*, *Betula pendula*, *Betula populifolia*
Euceraphis brevis Baker, on *Betula* sp.
Euceraphis deducta Baker, on *Betula populifolia*

Euceraphis gillettei Davidson, on *Alnus rugosa, Betula papyrifera*
Euceraphis lineata Baker, on *Betula alleghaniensis, Betula populifolia*
Euceraphis mucida (Fitch), on *Betula lenta*
Euceraphis punctipennis (Zetters.), on *Betula lenta, Betula papyrifera*
Hamamelistes spinosus Shimer, on *Betula alleghaniensis, Betula lenta, Betula populifolia*
Hormaphis hamamelidis (Fitch), Witch-hazel Leaf Gall Aphid, on *Betula* sp.
Longistigma caryae (Harris), The Giant Bark Aphid, on *Betula*
Macrosiphon carpinicolens Patch, on *Carpinus caroliniana*
Macrosiphon coryli Davis ?, on *Corylus americana*
Macrosiphon pseudocoryli Davis, on *Corylus americana, Ostrya virginiana*
Myzocallis alnifoliae (Fitch), on *Alnus glutinosa, Alnus incana, Alnus rugosa*
Myzocallis coryli (Goeze), on *Corylus america, Corylus avellana, Corylus cornuta, Corylus* sp.
Myzus persicae (Sulzer), on *Phytolacca americana*
Neosymydobius annulatus (Koch), on *Betula populifolia*
Oestlundiella flava (Davidson), on *Alnus rugosa*
Pemphigus balsamifera Williams ?, on *Betula nigra*
Prociphilus tessellatus (Fitch), on *Alnus glutinosa, Alnus incana, Alnus rugosa, Alnus* sp.
Pterocallis alni (DeGreer), on *Alnus* sp.

Aleyrodidae
Trialeurodes coryli Britton, on *Corylus*

Coccidae
Aspidiotus ancylus Putnam, Putnam's Scale, on *Betula papyrifera*
Chionaspis lintneri Comstock, on *Alnus, Betula*
Dactylopius indicus (Green), on *Opuntia* sp. in greenhouse
Eriococcus coccineus Ckll., on various greenhouse cacti
Phenacoccus acericola (King), on *Ostrya virginiana*
Lecanium caryae Fitch, The Hickory Lecanium, on *Betula*
Lecanium corni Bouche, European Fruit Lecanium, on *Corylus*
Lecanium nigrofasciatum Pergrand, Terrapin Scale, on *Betula*
Lecanium pruinosum (Coq.), The Frosted Scale, on *Betula*
Lepidosaphes ulmi (L.), Oyster-shell Scale, on *Betula papyrifera, Corylus*
Pulvinaria innumeralis (Rathvon), Cottony Maple Scale, on *Alnus*
Quadraspidiotus juglansregiae (Comstock, The Walnut Scale, on *Betula*
Quadraspidiotus pernicious (Comstock), San Jose Scale, on *Ostrya virginiana*

COLEOPTERA

Staphylinidae
Stenus humilis Er., in dying *Betula* sp.

Histeridae
Teretriosoma americanum Leconte, on *Betula alleghaniensis*

Buprestidae
Actenodes acornis Say, larvae in *Betula lenta*
Agrilus anxius Gory, Bronze Birch Borer, larvae in *Alnus, Betula papyrifera, Betula* sp.
Agrilus arcuatus Say var. *coryli* Horn, larvae forms galls on *Corylus americana, Corylus cornuta*
Agrilus obsoletoguttatus Gray, larvae in *Betula* sp., *Carpinus caroliniana, Ostrya virginiana*
Cinyra gracilipes Melsh., larvae in ironwood
Chrysobothris lecontei Lg., larvae in *Alnus*
Chrysobothris scitula Gory, larvae in *Alnus, Betula papyrifera, Betula populifolia*
Chrysobothris sexsignata Say, larvae in *Betula*
Cinyra gracilipes Melsh., larvae in *Ostrya virginiana*
Dicerca caudata Lee., larvae in *Betula lenta*
Dicerca divaricata Say, larvae in *Betula lenta*
Dicerca lurida Fabr., larvae in *Carpinus caroliniana*

Dicerca pugionata Germ., larvae in *Alnus*
Eupristocerus cogitans Web., larvae makes galls in *Alnus incana*, *Alnus rugosa*
Ostomidae
Thymalus marginicollis Chev., in *Piptoporus betulinus* on *Betula papyrifera*
Nitidulidae
Carpophilus floralis Er., on *Opuntia* flowers
Epurea avara Rand, on *Betula alleghaniensis*
Glischrochilus fasciatus Oliv., at sap on birch stump
Glischrochilus sanguinolentus Oliv., at birch sap
Coccinellidae
Coccinella perplexa Muls., plentiful on *Betula papyrifera* infested with plant lice
Melandryidae
Orchesia castanea Melsh., on birch fungus
Orchesia gracilis Melsh., on birch fungus
Dircaea quadrimaculata Say, reared from *Carpinus caroliniana*
Anobiidae
Dorcatoma setulosum Lec., in woody fungus on birch
Ptilinus ruficornis Say, on *Betula* sp., *Ostrya virginiana*
Scarabeidae
Euphoria inda L., Brown Fruit Chafer, on sap of injured *Betula* sp.
Popillia japonica Newman, Japanese Beetle, on *Betula populifolia*
Lucanidae
Ceruclus piceus Weber, larvae in decaying *Betula*
Cerambycidae
Analeptura lineola (Say), on *Betula, Carpinus caroliniana*
Anthoboscus ruricola Oliv., larvae in birch
Anthophylax cynaeus (Haldeman), on *Betula*
Anthophylax viridis Leconte, on *Betula*
Bellamira scalaris (Say), on *Betula*
Brachyleptura vagans (Oliver), on *Betula*
Clytus ruricola (Oliver), on *Betula*, *Ostrya*
Cyrtophorus verrucosus (Oliver), on *Betula*, *Carpinus caroliniana*, *Ostrya virginiana*
Distenia undata Fabr., on *Ostrya virginiana*
Gaurotes cyanipennis (Say), in wood of *Betula* sp.
Goes pulverulentus Hald., in *Carpinus caroliniana*, *Ostrya virginiana*
Gracilia minuta (Fabr.), on *Betula, Corylus*
Graphisurus fasciata Deg., larvae in *Betula alleghaniensis*
Leptorhabdium pictum (Haldeman), on *Betula*
Leptura aspera Lec., larvae in dead birch
Leptura emarginata Fabr., on *Betula*
Leptura mutabilis Newn., bred from *Alnus*, *Betula alleghaniensis*, *Betula papyrifera*, *Carpinus caroliniana*
Lepturges querci Fitch, larvae in *Ostrya virginiana*
Neoclytus acuminatus acuminatus (Fabr.), on *Betula*, *Ostrya*
Oberea tripunctata (Swed.), Dogwood Borer, on *Betula*
Pidonia ruficellis (Say), on *Betula*
Purpuricenus humeralis (Fabr.), on *Betula*
Saperda obliqua Say, bores in wood of *Alnus*, makes galls nearroots
Strangalepta lineola Say, larvae in dead birch
Strangalepta vittata (Swederus), on *Betula*
Strangalia acuminata (Oliver), on *Carpinus caroliniana*, *Ostrya virginiana*
Strangalia famelica famelica Newman, on *Betula*
Strangalia famelica solitaria Haldeman, on *Betula*
Trachysida mutabilis (Newman), on *Betula*, *Carpinus*, *Ostrya*
Trigonarthris minnesotana (Casey), on *Betula*

Tylonotus bimaculatus Haldeman, larvae in *Betula*
Typocerus velutinus velutinus (Oliver), on *Betula*
Xylotrechus colonus Fab., Rustic Borer, in *Betula alleghaniensis*
Xylotrechus quadrimaculatus (Haldeman), larvae in *Alnus*, *Betula*

Chrysomelidae

Bassareus brunnipes Oliv. var. *clathratus* Melsh., on *Alnus Chrysomela interrupta,* feed on leaves of *Alnus*

Curculionidae

Acoptus suturalis Lec., on *Ostrya virginiana*
Cryptorhynchus lapathi L., Poplar and Willow Borer, feeds on *Alnus, Betula nigra, Betula pumila*
Polydrusus impressifrons Gyll., The Leaf Weevil, on *Betula* sp.

Scolytidae

Dryocoetes betulae Hopk., in *Betula alleghaniensis*, *Betula papyrifera*
Pterocyclon mali Fitch, Apple Wood Borer, in birch
Trypodendron betulae Sw., birches

LEPIDOPTERA

Incurvariidae

Paraclemensia acerifoliella (Fitch), Maple Leaf Cutter, on birches adjacent to maple trees

Tineidae

Acrolophus morus (Grote), on *Betula*
Nemapogon tylodes (Meyr.), larvae on fungi under bark of dead alder twigs

Lyonetiidae

Bucculatrix canadensisella Chambers, The Birch Skeletonizer on both native and exotic birches

Gracilariidae

Caloptilia pulchella (Cham.), on *Betula alleghaniensis*
Cameraria hamadryadella (Clem.), on *Ostrya virginiana*
Cameraria lentella (Braun), on *Betula*, *Ostrya virginiana*
Cameraria ostryarella (Chambers), on *Carpinus caroliniana*, *Ostrya virginiana*
Gracillaria elongella (L.), on *Alnus*
Phyllonorycter ostryaefoliella (Clemens), on *Ostrya virginiana*
Phyllonorycter tritaenianella (Chambers), on *Ostrya virginiana*

Oecophoridae

Menesta tortriciformella Clemens, on *Corylus*
Nites betulella (Busck), on *Betula lenta*
Nites grotella (Robinson), on *Corylus*

Coleophoridae

Coleophora lentella Heinrich, on *Betula lenta*
Coleophora ostryae Clem., on *Ostrya virginiana*
Coleophora serratella (L.) (= *Coleophora fuscedinella* Zeller), Birch Casebearer, on *Betula*

Gelechiidae

Anacampsis nonstrigella Bsk., on *Ostrya virginiana*
Anacampsis tristrigella Walsingham, on *Corylus americana*
Dichomeris ligulella Hubner, Palmer Worm, on *Corylus*

Sesiidae (= Aegeriidae)

Synanthedon scitula (Harr.), on *Corylus*

Tortricidae

Ancylis muricana (Walsingham) var. *cornifoliana* (Rly.), on *Betula* sp.
Acleris comandrana (Fernald), larvae on *Commandra*
Acleris logiana (Clerck) [= *Peronea trisignana* (Robinson)], on *Betula papyrifera*
Acleris tripunctata (Hubner), on *Betula papyrifera*
Apotomis albeolana (Zeller), on *Betula papyrifera*
Archips argyrospila (Walker), The Fruit-tree Leaf Roller, on *Betula papyrifera*
Archips negundana (Dyar), on *Alnus* and *Betula papyrifera*

Epinotia solicitana (Walker), on *Betula papyrifera*
Epinotia stroemiana (F.) (=*Epinotia similana* Hubner), on *Betula*, *Corylus*
Epinotia transmissana (Walker), on *Betula*, *Corylus*
Epinotia walkerana (Kearfott), on *Corylus*
Olethreutes appendicea (Z.), on *Alnus*
Olethreutes corylana (Fernald), on *Corylus*
Olethreutes exoletus (Zeller), on *Corylus*
Olethreutes zelleriana (Fernald), on *Betula papyrifera*

Papilionidae

Papilio glaucus L., on *Alnus incana* subsp. *rugosa*

Lycaenidae

Feniseca tarquinius (Fab.), The Wanderer, mealy bugs or alder blight (*Schizoneura*) on alder

Nymphalidae

Basilarchia arthemis (Drury), White Admiral, on *Betula alleghaniensis*, *Betula lenta*
Basilarchia astyanax (Fabr.), Red Spotted Purple, on *Carpinus caroliniana*
Nymphalis antiopa (L.), Mourning Cloak, on *Betula*
Nymphalis j-album (Boisduval & Leconte), Large Tortoise-shell, on *Betula papyrifera*, *Betula populifolia*
Polygonia faunus (Edwards), Green Comma, on *Betula papyrifera*
Polygonia progne (Cramer), Gray Comma, on *Betula papyrifera*

Limacodidae

Apoda y-inversum (Packard), on *Carpinus*
Tortricidia testacea Packard, on *Betula* sp.

Pyralidae

Acrobasis betulella Hulst, on Betula
Nealgedonia extricalis (Guen.), on *Alnus*
Herpetogramma aeglealis (Walker), on *Phytolacca*
Herpetogramma thestealis (Walker), on *Corylus*
Melitara prodenialis Wlk., on *Opuntia*

Thyatiridae

Habrosyne scripta (Gosse), on *Betula lenta*, *Betula papyrifera*
Pseudothyatira cymatophoroides (Guenee), on *Betula alleghaniensis*, *Corylus cornuta*

Drepanidae

Drepania arcuata Walker, on *Alnus incana* subsp. *rugosa*, on *Betula alba*, on *Betula alleghanensis*,, on *Betula papyrifera*
Drepania bilineata (Packard), on *Betula papyrifera*

Geometridae

Alsophila pometaria (Harris), Fall Canker Worm, on *Ostrya virginiana*
Anagoga occiduaria (Walker), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Archiearis infans (Moeschler), on *Betula papyrifera*, *Betula populifolia*
Biston cognataria (Guenee), Pepper and Salt Currant Moth, on *Betula alba*, *Betula lenta*, *Betula papyrifera*, *Corylus cornuta*
Campaea perlata (Guenee), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Cepphis armataria (H-S.), on *Betula* sp.
Cingilia catenari (Drury), Chain-dotted Geometer, on *Betula papyrifera*, *Betula populifolia*, *Corylus americana*
Drepanulatrix foeminaria (Guenee), on *Betula papyrifera*, *Corylus americana*
Ectropis crepuscularia (D. & S.), on *Alnus*
Ennomos subsignarius (Hubner), The Elm Spanworm, on *Betula alleghaniensis*, *Carpinus caroliniana*, *Ostrya virginiana*
Epirrita autumnata (Bkh.), on *Carpinus caroliniana*
Erannis tiliaria (Harris), Linden Looper, on *Betula*, *Carpinus caroliniana*
Eufidonia discospilata (Walker), on *Betula papyrifera*
Eulithis testata (L.), on *Betula* sp.
Hypagyrtis unipuncta (Haw.), on *Betula* sp.
Hypomecis umbrosaria (Hubner), on *Betula alba*, *Betula papyrifera*
Itame anataria (Swett), on *Betula alleghaniensis*, *Betula populifolia*
Lambdina fiscellaria (Guenee), on *Betula alleghaniensis*, *Betula papyrifera*
Lomographa vestaliata (Guenee), on *Carpinus caroliniana*

Melanolophia canadaria (Guenee) on *Betula alleghaniensis*
Metarranthis duaria (Guenee), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Metarranthis pilosaria (Packard), on *Betula papyrifera*
Metarranthis warnerae (Harvey), on *Betula papyrifera*
Nematocampa limbata (Haworth), on *Betula populifolia*
Nemoria bistriaria Hubner [= *Racheospila rubrolinearia* (Pck.)], on birch
Nemoria mimosaria (Guenee), on *Betula papyrifera*
Nepytia canosaria (Walker), on *Betula papyrifera*
Paleacrita vernata (Peck), Spring Canker Worm, on *Betula alba*, *Betula papyrifera*, *Ostrya virginiana*
Phigalia titea (Cramer), Half-winged Geometer, on *Carpinus caroliniana*
Plagodis alcoolaria (Guenee), on *Betula papyrifera*
Plagodis phlogosaria (Guenee), on *Betula papyrifera*
Plagodis serinaria Herrich-Schaeffer on *Betula alleghaniensis*, *Betula papyrifera*
Probole amicaria (Herrich-Schaeffer), on *Betula alleghaniensis*, *Carpinus caroliniana*
Protoboarmia porcelaria (Guenee), on *Betula alleghaniensis*
Rheumaptera hastata (L.), on *Betula papyrifera*
Selenia kentaria (Grote & Robinson), on *Betula papyrifera*
Tacparia detersata (Guenee), on *Alnus incana* subsp. *rugosa*
Tetracis cachexiata Guenee (= *Tetracis lorata* Grote), on *Betula alleghaniensis*, *Betula papyrifera*

Lasiocampidae

Malacosoma americana (Fabricius), Eastern Tent Caterpillar, on *Betula*
Malacosoma disstria Hubner, Forest Tent Caterpillar, on *Betula papyrifera*, *Betula populifolia*, *Carpinus caroliniana*

Saturniidae

Actias luna (L.), Luna Moth, on *Betula papyrifera*, *Betula* sp., *Castanea dentata, Fagus grandifolia, Ostrya virginiana*
Anisota senatoria (J.E. Smith), The Orange striped Oakworm, on *Betula alba*, *Betula papyrifera*, and *Corylus*
Anisota virginiensis (Drury), on *Carpinus caroliniana*
Antheraea polyphemus (Cramer), on *Betula nigra*, *Carpinus caroliniana*, *Corylus americana*, *Ostrya virginiana*
Automeris io (Fabr.), Io Moth, on *Betula*, *Carpinus caroliniana*, *Ostrya virginiana*
Eacles imperialis (Drury), Imperial Moth, on *Betula alba*, *Betula papyrifera*, *Betula populifolia*, *Carpinus caroliniana*, *Ostrya virginiana*
Hemileuca maia (Drury), Buck Moth, on *Betula populifolia*
Hyalophora cecropia (L.), The Cecropia Moth, on *Betula*

Sphingidae

Ceratomia amyntor (Geyer), Four Horned Sphinx, on *Betula alba*
Paonias excaecatus (J.E. Smith), Blind-eyed Sphinx, on *Betula papyrifera*, *Carpinus caroliniana*, *Ostrya virginiana*
Smerinthus jamaicensis (Drury), Twin Spotted Sphinx, on *Carpinus caroliniana*, *Ostrya virginiana*
Sphinx luscitiosa Clemens, on *Betula papyrifera*

Notodontidae

Datana angusi Grote & Robinson, on *Betula populifolia*
Datana integerrima Grote & Robinson, The Walnut Catarpiller, on *Betula*
Datana ministra (Drury), Yellownecked Caterpillar, on *Betula alba*, *Betula nigra*, *Betula papyrifera*, *Betula populifolia*, *Corylus americana*
Gluphisia septentrionalis (Walker), on *Betula alleghaniensis*
Heterocampa biundata Walker, on *Betula alleghaniensis*, *Betula papyrifera*
Heterocampa guttivitta (Walker), Maple Prominent, on *Ostrya virginiana*
Heterocampa leucostigma (Smith), The White-marked Tussock Moth, on *Betula*
Heterocampa umbrata Walker, on *Carpinus caroliniana*
Lochmaeus manteo Doubleday, on *Betula lenta*, *Betula papyrifera*
Nadata gibbosa (J.E. Smith), on *Betula papyrifera*
Oligocentria lignicolor (Walker), on *Betula alba*, *Betula papyrifera*
Oligocentria semirufescens (Walker), on *Betula papyrifera*
Peridea ferruginea (Packard), on *Betula papyrifera*
Schizura concinna (J.E. Smith), Redhumped Caterpillar, on *Betula alba*, *Betula papyrifera*
Schizura ipomaeae Doubleday, on *Betula*

Schizura leptinoides (Grote), on *Carpinus caroliniana*, *Ostrya virginiana*
Schizura unicornis (J.E. Smith), Unicorn Prominent, on *Betula alba*, *Corylus americana*
Symmerista albifrons (J.E. Smith), on *Betula papyrifera*

Arctiidae

Lophocampa caryae Harris, Hickory Tussock Moth, on *Betula alba*, *Betula papyrifera*, *Betula populifolia*, *Carpinus caroliniana*, *Ostrya virginiana*
Lophocampa maculata Harris, Spotted Tussock Moth, on *Alnus incana* subsp. *rugosa*, *Corylus americana*, *Ostrya virginiana*
Halisidota tessellaris (J.E. Smith), Banded Tussock Moth, on *Betula alba*, *Betula papyrifera*, *Carpinus caroliniana*, *Ostrya virginiana*
Hyphantria cunea (Drury), Fall Webworm, on *Alnus*
Pyrrharctia isabella (J.E. Smith), Black Tipped Bear, on *Betula alba*, *Betula papyrifera*

Lymantriidae (Liparidae)

Dasychira cinnamomea (Grote & Robinson), on *Ostrya virginiana*
Dasychira vagans (B.& McD), on *Betula papyrifera*
Euproctis chrysorrhoea (L.) [= *Nygmia phaeorrhoea* (Donovan)], Brown-tail Moth, on *Betula papyrifera*
Lymantria dispar (L.), Gypsy Moth, on *Alnus*
Orgyia antiqua (L.), Antique Tussock Moth, on *Alnus incana* subsp. *rugosa*, *Betula alleghaniensis*, *Betula populifolia*, on *Corylus americana*
Orgyia leucostigma (J.E. Smith), on *Alnus incana* subsp. *rugosa*, on *Corylus americana*

Noctuidae

Achatia distincta Hubner, on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Acontia expolita (Grote), on *Corylus cornuta*
Acronicta americana (Harris), American Dagger Moth, on *Betula alba*, *Betula populifolia*, *Carpinus caroliniana*
Acronicta betulae Riley, on *Betula nigra*
Acronicta dactylina Grote, on *Alnus rugosa* subsp. *rugosa*, *Betula alba*, *Betula papyrifera*
Acronicta falcula (Grote), on *Corylus*
Acronicta fragilis (Guenee), on *Betula papyrifera*
Acronicta funeralis (Grote & Robinson), on *Betula* sp.
Acronicta grisea Walker, on *Betula papyrifera*
Acronicta hastulifera (J.E. Smith), on *Alnus*
Acronicta innotata Guenee, on *Betula* sp.
Acronicta interrupta Guenee, on *Betula* sp.
Acronicta leporina (L.) var. *vulpina* (Grote), on *Betula* sp.
Acronicta ovata Grote, on *Betula alleghaniensis*
Acronicta superans Guenee, on *Betula papyrifera*
Anaplectoides pressus (Grote), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Autographa ampla (Walker), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Baileya ophthalmica (Guenee), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*, on *Corylus cornuta*
Bomolocha sordidula (Grote), alder
Catocala relicta Walker, on *Betula papyrifera*
Cerastis tenebrifera (Walker), on *Betula papyrifera*
Charadra deridens (Guenee), on *Betula papyrifera*
Colocasia flavicornis (J.E. Smith), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Colocasia propinquilinea (Grote), on *Betula papyrifera*
Enargia decolor (Walker), on *Alnus incana* subsp. *rugosa*
Euplexia benesimilis McD., on *Alnus incana* subsp. *rugosa*
Eueretagrotis perattenta (Grote), on *Betula papyrifera*
Eueretagrotis attenta (Grote), on *Betula papyrifera*
Lacanobia lutra (Guenee), on *Alnus incana* subsp. *rugosa*
Lacanobia radix (Walker), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Lacanobia tacoma (Stkr.), on *Betula papyrifera*
Lithophane bethunei (Grote & Robinson), on *Betula papyrifera*
Lithophane fagina Morr., on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Lithophane pexata Grote, on *Alnus incana* subsp. *rugosa*

Melanchra assimilis (Morr.), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Morrisonia confusa (Hubner), on *Betula papyrifera*
Oligia mactata (Guenee), on *Betula populifolia*
Orthosia hibisci (Guenee), on *Alnus incana* subsp. *rugosa*
Orthosia revicta (Morrison), on *Betula alleghaniensis*
Orthosia rubescens (Walker), on *Alnus incana* subsp. *rugosa*
Palthis angularis (Hubner), on *Betula papyrifera*
Paradiarsia littoralis (Pack.), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Phlogophora periculosa Guenee, on *Alnus incana* subsp. *rugosa*
Polia detracta (Walker), on *Betula populifolia*
Polia imbrifera (Guenee), on *Betula papyrifera*
Polia latex (Guenee), on *Alnus incana* subsp. *rugosa*
Polia nimbosa (Guenee), on *Alnus incana* subsp. *rugosa*, on *Betula papyrifera*
Polia purpurissata (Grote), on *Alnus*, *Betula populifolia*
Pseudanthracia phaeocapna Franc., on *Corylus cornuta*
Pyrrhia umbra (Hufnagel), on *Alnus*
Scoliopteryx libatrix (L.), on *Betula papyrifera*
Spiramater lutra (Guenee), on *Alnus*, on *Betula* sp.
Zale lunata (Drury), on *Alnus*
Zale minerea (Guenee), on *Ostrya virginiana*
Zanclognatha cruralis (Guenee), on *Corylus cornuta*

DIPTERA

Cercidomyiidae

Campylomyza carpini Felt, on *Ostrya virginiana*
Cecidomyia pudibunda O.S., inhabits a red tinged leaf fold on *Ostrya virginiana*
Dasyneura serrulatae O.S., produces a bud gall on alder
Itonida opuntiae Felt, reared from discolored more or less decaying areas on various species of *Opuntia* at NYBG
Itonida putrida Felt, reared from decaying birch wood inhabited by numerous larvae of *Bolitophila cinerea*
Lasiopteryx carpini Felt, on *Carpinus caroliniana*, *Ostrya virginiana*
Lasiopteryx coryli Felt, reared from a fuzzy, wrinkled, fold gall at the base of *Corylus* leaves
Miastor americana Felt, common in the decaying bark of birch
Mycodiplosis coryli Felt, on *Corylus*
Mycodiplosis corylifolia Felt, reared from a fuzzy, wrinkled leaf fold gall on hazel produced by *Lasiopteryx coryli* Felt, also on *Betula lenta*
Neolasioptera basalis Felt, on *Corylus*
Odontodiplosis americana Felt, on *Alnus*
Oligotrophus betulae Winn., an introduced European species reared from deformed white birch catkins, the normal alate seed being transformed into a globose gall with rudimentary alae
Parallelodiplosis carpini Felt, on *Carpinus caroliniana*
Parallelodiplosis coryli Felt, on *Corylus*
Phytophaga electra Felt, on *Corylus*
Winnertzia carpini Felt, on *Carpinus caroliniana*

Agromyzidae

Phytobia pruinosa (Coq.), cambium borer on *Betula*

HYMENOPTERA

Pamphiliidae

Pamphilius ocreatus (Say), larvae feed on *Corylus*

Tenthredinidae

Amauronematus luteotergus (Nort.), larvae feed on foliage of *Alnus*

Croesus latitarsis Nort., The Dusky Birch Sawfly, on *Betula alleghaniensis*, *Betula lenta*, *Betula nigra*, *Betula papyrifera*, *Betula populifolia*

Empria coryli (Dyar), larvae feed on *Corylus*

Fenusa dolurnii (Tischbein), European Alder Leaf Miner, on *Alnus* spp.

Fenusa pumila Klug., Birch Leaf-miner, common on *Betula populifolia*

Fenusa pusilla (Lepeletier), leaf miner on *Betula alba*, *Betula papyrifera*, and *Betula populifolia*

Hemichroa dyari Roh., larvae feed on *Alnus*

Iphiaulax agrili (Ashm.), a parasite of *Agrilus arcuatus* on *Corylus* and *Neoclytus acuminatus*, on *Betula* and *Ostrya*

Nematinus chloreus (Nort.), larvae feed on foliage of birch

Nematinus unicolor (Dyar), larvae feed on foliage of *Betula papyrifera*

Pristiphora sycophanta (Walsh), feeding on foliage of *Betula papyrifera*

Pteronidea erythrogaster (Nort.), larvae feed on foliage of *Alnus rugosa*, *Carpinus caroliniana*

Pteronidea hyalina (Marl.), larvae feed on foliage of *Betula papyrifera*

Pteronidea lateralis (Nort.), larvae feed on foliage of *Betula populifolia*

Pteronidea latisfasciata (Cresson), larvae feed on foliage of *Betula papyrifera*

Pteronidea pinguidorsum (Dyar), larvae feed on foliage of *Betula papyrifera*

Tenthredella cressoni (Kby.), larvae feed on *Betula papyrifera*

Argidae

Arge macleayi (Leach), on *Betula lenta*, *Betula papyrifera*, *Corylus*

Xiphydriidae

Xiphydria erythrogastra Ashm., larvae feed in *Carpinus caroliniana*

Vespidae

Vespa crabro germana (Christ), giant hornet, injurious to *Betula* bark

Andrenidae

Andrena nigrae Robertson, on *Alnus*

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INDEX TO LATIN NAMES

Note: Boldface indicates a name used in this treatment for a species known to occur in the wild in New York State.

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